Society and Nature in the Lower River Nyando Basin, Kenya

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Kinda e teko.[1]

[1] Persistence is strength. (Dholuo proverb)

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ARV	Anti-Retrovirals
ACH	Awach/Achego
CIGs	Common Interest Groups
CREPP	Community Rehabilitation and Environment Protection Programme
COSOFAP	Consortium for Scaling-up Options for Increased Farm Production in Western Kenya
CDF	Constituency Development Fund
DL	Discussion Leader
DAO	District Agricultural Officer
DC	District Commissioner
DDO	District Development Officer
DDP	District Development Plan
DDMCs	District Disaster Management Committees
DECs	District Environment Committees
DEO	District Environmental Officers
DMCN	Drought Monitoring Centre Nairobi
DN	Daily Nation
EAS	East African Standard
FCC	Flood Control Committee
FFW	Food or Voucher for Work
GoK	Government of Kenya
GD	Group Discussions
ICPAC	IGAD Climate Prediction and Applications Centre
ICRAF	World Agroforestry Centre
IDNDR	International Decade for Natural Disaster Reduction
IGAD	Intergovernmental Authority on Development
ISOE	Institute for Social Ecology
JICA	Japanese International Cooperation Agency
KAO	Kakola-Ombaka
KARI	Kenyan Agricultural Research Institute
KMD	Kenyan Meteorological Department
KRCS	Kenyan Red Cross Society
LBDA	Lake Basin Development Authority
LVBC	Lake Victoria Basin Commission
LUC	Land Use Change
NALEP	Livestock Extension Project
LATF	Local Authority Transfer Fund
LNB	Lower River Nyando Basin
MTEF	Medium Term Expenditure Framework
MDGs	Millennium Development Goals
MoA	Ministry of Agriculture
MoWI	Ministry of Water and Irrigation
MICCA	Mitigating the Effect of Climate Change on Agriculture

NAK	Nakuru Village
NDP	National Development Plan
NDOC	National Disaster Operation Centre in the office of the president
NEMA	National Environmental Management Authority
NIB	National Irrigation Board
JE	Nyakach- Jimo East
PRSPs	Poverty Reduction Strategy Papers
PIU	Provincial Irrigation Unit
DSDO	Social Development Office
SES	Socio-Ecological System
SESs	Socio-Ecological Systems
SNR	Society–Nature Relations
SAP	Structural Adjustment Programme
TASK	The Improved Agriculture for Smallholders in Western Kenya
UNEP	United Nations Environmental Programme
VIRED	Victoria Institute for Research on Environment and Development

Summary

Society-nature relations are regarded as being in crisis; climate change, droughts, floods, environmental degradation have become familiar features in today's news. While there still is a general belief in our capacity to influence what is going to happen, discussions on society-nature relations are characterised by a growing awareness of uncertainty about the best way to manage the environment. This is to a great extent attributed to the fact that a holistic view on problems is missing, as for a long-time the solution was sought in ever more specialized knowledge. In order to overcome that, interdisciplinary approaches looking at society-nature relations are discussed.

The thesis deals with the possibilities of researching and conceptualising society-nature relations in the Lower River Nyando Basin, Kenya with a focus on floods and agriculture. It is comprised of a short theoretical part, after which the subsequent case study deals with the presentation of the socio-ecological setting and the possibility to reach a holistic examination of the socio-ecological dynamics within a certain area. On-going changes are discussed using the terms risk and resilience. In the theoretical part the difficulties of an interdisciplinary approach are addressed by (a) highlighting the starting points of natural science and social science (this involves among others quantitative versus qualitative science and explaining versus understanding) and by (b) looking at terminology and suggesting a more conscious use of vocabulary in order to improve the way we reason about society-nature relations. The terms risk, vulnerability and resilience are used as examples, as they are prevalent in natural and social science. Concerning (a) it is concluded that we need to reflect on the reasons behind labelling something in a specific way and to discuss why a specific representation is used. Furthermore it is argued that the importance of different perspectives should be acknowledged. Concerning (b) it is argued that risk should be seen as pointing to the limits of calculation and the importance of making decisions (this includes realizing situations where no conscious decision takes place). In order to reasonably differentiate vulnerability and resilience, it is suggested that resilience should be seen as allowing a focus on long-term developments, instead of short-term events. The important input those concepts give to the analysis of SNR is to facilitate discussions around decision-making and its background.

The empirical part of the thesis concentrates on the presentation of SNR in the Lower River Nyando Basin (LNB) in Kenya. The case study serves as a means to highlight and discuss the problems of studying SNR. The LNB can be seen as an area that is changing rapidly and thereby makes it difficult to make confident decisions. Established resource use strategies and coping mechanisms lose their effectiveness. After presenting an overview of the broad scale changes from a historical perspective in the area (Chapter 5), the study focuses on the different actors and their contribution to SNR. Special attention is given to agricultural changes from a farmer's point of view. Agriculture is discussed from different angles in Chapter 6. Among others the role of natural rainfall variability, the impacts of the introduction of new seeds, the possibilities of intensification and social aspects such as social cohesion and the attitude towards farming are examined. In the concluding part of this chapter the possibility to identify key drivers that explain the dynamics is addressed, as well as the contribution of the terms risk and resilience for reflecting on them. As flooding is a common event in the study area, a closer look at the role of floods is taken in Chapter 7. It is analysed what kind of measures exist and are used to regulate floods and what the problems of regulation are. The underlying causes of the effects of floods on livelihoods - seen as being attributed to natural variability as well as to social and economic changes - are analysed. It is argued that floods, while often presented as a disaster, have to be understood in the context of long-term socio-ecological variability and change, in order to avoid misguided judgement or action.

The dissertation ends with a reflection on the role of the society-nature differentiation, the contribution of risk and resilience to think about variability and change and the possibility to positively influence SNR. As kind of a final thought first suggestions for the development of a common research framework are made.

1 Introduction: problem description and structure of the thesis

Society-nature relations (SNR) are regarded and discussed as being in crisis (e.g. Brand 2011, Görg 1998, Washington 2013). The all too common headlines point to a situation in which the environment becomes less supportive of comfortable human survival. Common examples are the reduction of the natural food production potential as well as direct threatening of human health or life through diseases, pollution and an increase in extreme climatic events (droughts, floods, storms). Often this crisis is framed as an ecological crisis; however this is a human view point, as nature is heedless of good or bad[2]. The criteria used to declare an ecological crisis are basically those related to a mismatch between the provision of services by nature and societies' demands.

The main reasons for the crisis are seen in human mismanagement and careless exploitation; thereby destroying the natural basis of reproduction. While nevertheless there is a general belief in man's capacity to manage the environment and influence what is going to happen, current discussions on SNR are also characterised by a new uncertainty about this manageability (e.g. Balint et al. 2011, Craig et al. 2011, Polasky et al. 2011). Problems are, to a great extent, attributed to the fact that a holistic view on actions and their consequences has been lacking and people relied too much on ever more specialized knowledge. Consequently, there is a call for an integrative interdisciplinary approach[3].

Socio-ecological interdisciplinary approaches can be discussed from a highly theoretical and philosophical point of view, or rather from a pragmatic point of view. While the goal to solve societal problems in relation to its environment is, at least at first sight, a tangible and practical goal, it is more difficult to imagine what an interdisciplinary socio-ecological approach tries to achieve from a theoretical point of view. Social scientists often complain that their contribution to interdisciplinary research is reduced to delivering demographic facts. On the contrast natural scientists often are upset as they cannot see any possibility of working together with social scientists, as long as those claim that they do not believe in any functional relation between objects, and knowledge is seen as being context dependent[4].

[2] From an ecological point of view it might only be possible to talk about change and differentiate velocities of change (and maybe discover that permanence/durability is a cultural achievement).

[3] The call for sustainable development in the 1980s can be seen as a milestone within this debate.

[4] Discussion during an interdisciplinary Colloquium in Fribourg, WS 2008/2009, which in similar form can be heard in conferences, with similar concerns and misconceptions being raised.

Given that I wanted to do interdisciplinary research I was confronted with this problem. Coming from the social sciences, my general understanding was that we cannot reach law-like explanations, but on the other hand natural sciences demanded exactly that: to derive generalizable statements. Therefore, this study deals with the challenges of trying to combine natural and social science in an interdisciplinary approach. It presents different aspects of the question posed by Becker/Jahn (2006):

> „How can we conceptualise, understand, detect and research, influence and shape the multiple relations between human beings, society and nature." (ibid: 35f; own translation)[5]

The starting point of this thesis was to discuss the prospects of an interdisciplinary approach which is trying to create new and collective ways of working and producing knowledge (new forms of intelligibility), rather than a mere agglomeration of different perspectives.

The thesis aims at discussing possibilities of conceptualising and researching society-nature relations in the Lower River Nyando Basin, Kenya with a focus on floods and agriculture. In order to do so, the thesis is comprised of a theoretical part (Chapter 2 and 3) that highlights the different understanding of dynamics in natural and social science and suggests a more conscious use of vocabulary and concepts in order to improve the way we reason about SNR. Thereafter a case study is using the theoretical insights in order to discuss SNR in the Lower River Nyando Basin (LNB), Lake Victoria (Chapter 5 to 7).

Chapter 2 deals with the most prevalent differentiation between natural and social science. It is seen as vital to reflect on this difference in order to meaningfully engage in interdisciplinary science. Apart from discussing different conceptions of 'nature', the different understandings of dynamics and processes in natural and social sciences (seen as the basic divide between these two disciplines) are presented. This is then exemplified along the discussion of the actor-structure divide and the role of scale for analysing and evaluating a situation. The following part presents current approaches of talking about SNR. Chapter 3 discusses how the concepts of risk and resilience relate to understandings of dynamics, and what their role is for management and decision-making. Chapter 4 concludes by summarising the gained insights with regard to the possibility of explaining and managing SNR and outlines the empirical part of the study.

The empirical study (part B) discusses SNR in the Lower River Nyando Basin (LNB), Kenya, with a focus on small-scale farming. The case study serves as a means to highlight and discuss the multitude of factors influencing SNR and further discusses the way that a risk or resilience focus helps in understanding and guiding management decisions.

[5] "Wie lässt sich das Geflecht der Beziehungen zwischen den Menschen, der Gesellschaft und der Natur denken und begreifen, erkennen und erforschen, beeinflussen und gestalten?" Becker/Jahn (2006: 35f)

In the concluding Chapter 8, the limits and constraints of an interdisciplinary approach are reflected upon, some recommendations for the management of socio-ecological change are made and some ideas for the development of a common research framework are presented.

A . Conceptual thoughts

2 How to discuss society-nature relations

Around the call for a more integrative perspective, discussions about interdisciplinary approaches have been taking place for quite a long time; however the conceptual basis of a social science-natural science interdisciplinary approach is still not sufficiently clear. In geography the call for interdisciplinary approaches is seen by many as a return to the roots of academic understanding of the discipline's holistic approach, which was left for the sake of specialization during the 1960s (Antrop 2003:44).[6] In sociology Dunlap/Catton (1979) challenged the dominant anthropocentrism of social theory. Current discussions about the differentiation of nature and society can only be understood against this background of the history of different scientific disciplines, taking into account the need to find arguments for a new discipline, or to reject dominant discourses or arguments. In social science an important argument for a long time was that the social could only be explained out of the social (Durkheim 2002). With this statement, sociologists wanted to stay away from any geo-deterministic interpretations[7]; society was to be interpreted as a "reality of its own kind" (Brand 1998:13). Subsequently, emphasis was on the human capability to influence and change nature; thereby making way for the neglect of the limits of nature. The accusation of having a deterministic view also explains why social geographers refused for some time to accept any relation to 'the natural'.

> "It wasn't until political ecology came along […] that critical social geographers could safely engage the environment without fear of being tarnished as determinists." Smith et al. (2009: 16)

Nowadays, numerous attempts to integrate natural and social science exist: Social Ecology[8], Cultural Ecology (e.g. Sutton/Anderson 2010), Political Ecology (e.g. Blaikie 1999), and Human Ecology (e.g. the journal with the same name) are just some of the headlines

[6] Mackinder in 1887 (in Demeritt 2009) states that geography is bridging the gap between the natural and the social, while Demeritt argues in 2009 that geography became highly specialised and he sees no reason why geography should be more successful in combing the disciplines.

[7] Geo-determinism sees the social and social development as being determined by nature (e.g. climate).

[8] E.g. at the Institute for Social Ecology in Klagenfurt (http://www.uni-klu.ac.at/socec)

under which discussion about SNR are on-going. In general, they either try to get a holistic picture of the relation of social and natural factors, or try to understand decision-making in natural resource management (e.g. based on different perceptions or power relations). Currently there is a vibrant discussion in geography concerning the integration, and it is tried to establish research on SNR as a discrete scientific object as the third pillar of geography with its own specific way of looking at a problem (Weichhart 2005: 112).

2.1 *The society-nature dichotomy*

In discussions about interdisciplinarity the relation between natural and social science is either discussed by the object of study (Weichhart 2005: 114) or by the main reasoning with regard to the relations between objects (the underlying dynamics). The purpose of this chapter is to highlight some of the difficulties of the notion of nature and its relation to the social and to create awareness about the implications of different ways of conceptualisation of the society-nature dichotomy.

Nature is a contested term that means different things to different people at different times and in different places (Ginn/Demeritt 2009). Common sense might describe nature as anything that is related to plants and animals[9] as well as their normal environment (water, air, soil, the planets and the universe) and would continue to exist without human interference. Referring to something as being natural is often used as a sign and an assertion of quality, peaceful harmony and originality. But, when thinking about mud, cold, diseases and other quite 'natural' things, independence from nature is regarded as a big achievement of humanity. However, the differentiation has many more connotations.

The variety of connotations becomes obvious, by looking at common dichotomies of the natural and the 'non-natural', which are nature/society, material/symbolic, wild/civilised, nature/culture, given/made (as e.g. Strathern 1992 or Carsten 2000). When talking about the material versus the symbolic, the focus is on the capacity of human agency to put meaning to (symbolic aspect) and to reason about the world, while nature (the material) is being governed by laws. When referring to the civilised versus the wild, the focus is specifically on order. Nature is conceptualised as being unpredictable, disorderly, and wild, while civilised points at something which is much more refined, organised and easier to control. The nature-culture dichotomy points at determinism versus freedom on the one hand, and on the other hand at an imagined 'point of departure' from a pre-human untouched state, a pristine nature, which is worth to be maintained. Referring to something as pristine nature is then often used to make normative claims. It has a strong persuading potential, however at closer examination, it is hard to account for this pristine nature in many cases. Two extreme

[9] The question here is, whether human beings belong to the natural sphere or not.

viewpoints can be observed; one is to claim that mankind should have remained hunter-gatherers in order not to destroy nature (based on the image that hunter-gatherers lived in harmony with nature), the other is to argue that human capacity and technological innovation help to solve and avoid 'natural' problems[10].

Taking this into consideration, Goldman/Schurmann (2000) present approaches which are trying to make a shift away from the nature-society dichotomy. One of them is the New Political Ecology, which focuses on the mutual constitution of nature and society, including an analysis of environmental struggles as symbolic and material at the same time. In Political Ecology it is for example analysed how a referral to 'the natural' is used to give claims a convincing justification; arguing that attention needs to be given to the way in which specific perceptions shape reality. Goldman/Schurmann (2000) emphasise the need to understand why, when, and how people can refer to completely different categories when they discuss nature. By doing so it is seen as possible to challenge dominant discourses of environment; e.g. to identify the perceived need for environmental conservation as the outcome of Western "truth regimes" (ibid: 570).

With highlighting these dichotomies, it is argued that the scientists should be critical about any kind of representation and reflect on the reasons behind calling something (non-)natural.[11] This makes it necessary to carefully ask who gets a voice in the evaluation of a given setting. And actually this starts with paying attention to the way things are represented.

It is language that best allows us to describe the world and to communicate; language can create worlds and contexts of reasoning. And as there is no ideal language, there is a need to be conscious about the use of terms. In contrast to that, however, the careless use of language in science often obscures rather than clarifies issues. Notions are used metaphorically and with different connotations in one paper, one paragraph, even in one sentence. Science is about saying, writing, describing and thereby representing the world (Zierhofer 1999). This is why in Chapter 3 the notions risk, resilience and vulnerability which are used in natural as well as in social science, are discussed.

[10] For alternatives to those simplifying before-after narrations, see e.g. Leach/Mearns (1996) or Kreike (2010)

[11] Hacking (2000/1999) posed the provocative question: "The social construction of what?". A question which was similarly framed by Demeritt (2002: 780) as: "To what extent does the world 'constrain' our concepts of it, or at least our epistemologically warranted concepts of it?". This points to the question of what it is that makes some conceptions prevail, while others do not. While some will see ontological properties as being the most relevant factor influencing our constructions, others would rather focus on the process of the construction, arguing that power structures will determine what is seen as a legitimate representation (Foucault 2000).

2.2 *Social science and natural science –dynamics and theory*

"Words are prisons as well as searchlights and pigeon-holes." Stibbs (1998)

This chapter presents different ways of analysing dynamics based on either explaining or understanding and discusses the roles that theories play in (natural) science and social science.

Current theoretical debates increasingly focus on "processes, relationships and interactions between phenomena as holding the greatest potential for developing a more integrated view of the world with us in it" (Couper 2007: 291). The differentiation does not focus any longer on ontological aspects but rather on determinism versus freedom (or voluntarism) (Zierhofer 1999). This in fact, goes back to the basic divide between (natural) science and social science, which is between explaining and interpretative understanding (Bransen 2001).

Explaining in natural science basically refers to an analysis of law-governed causality. Causality is the most dominant mode of intelligibility in natural science, which relies on regularities and is based on the premise that the same cause will have the same effect. The power of the natural science explanation therefore lies in its potential of predictions. In contrast, in social science the focus is on an understanding of intentionality and reason as guiding action[12], to "make empathetic sense of the phenomenon by looking for the perspective from which the phenomenon appears to be meaningful and appropriate" (Bransen 2001:16165). The attribution of meaning is seen as distinguishing humans from the non-human. Therefore an understanding of human action needs to start from the goals (forward looking) that actors pursue, and to look for the subjective reason, instead of looking for general cause and effect relations (with a focus on the given or the past).

Whether human will is free cannot be part of the discussion here; it is, however, argued that it is enough to state, that human beings can communicate through symbols and that language (which is made of symbols) does influence action[13]. What we perceive depends on the knowledge, experience and the concepts we have in mind. It is through communication and experience that we change the way we look at the world; and the ways we look at things determine our action. On the other hand, thoughts in the final end only become powerful, when they materialise. Wardenga/Weichhart (2006; own translation) ask: "How can

[12] founding father Dilthey (1973)

[13] While it is assumed that human intention is not deterministic, the relation between sense and matter, the symbolic and the material is still seen in need of clarification (Zierhofer 1999). What human beings want to achieve in the future might indeed be based on cause-effect relations inside our brain, but this question needs to be solved on a different (philosophical, neurological) level than the one on which this discussion takes place; if it needs to or can be solved at all.

we grasp the causal effect of the material world on individuals and society in a non-deterministic way[14]. I argue: the material world is not the cause of action, but it influences and gives some limits to the consequences of our actions. In that way it influences action in a non-deterministic way; there still is choice.

In this context the distinction between quantitative and qualitative science is also used. Quantitative science is often referred to as being positivist (natural science), while qualitative science is seen as the hermeneutic science of interpretation (understanding). Quantitative methods in social science are often criticised for "a tendency to Cartesian reductionism […], an inability to identify the processes and structures driving observed relationships, [as well as misguiding] claims of objectivity […]" (Sheppard 2001: 539). This is why, according to Sheppard (2001), critical geography has become anti-quantitative in tone. At the same time, nowadays it is realised that quantitative science cannot explain everything[15] and it is argued that testing hypothesis against pure facts is impossible. Therefore, Sheppard argues that mathematics should simply be seen as a language; one way of interpreting and representing what we see[16]. He argues that complexity theories have called into question, the "traditional emphasis in mathematics (and positivism) on deriving general theorems and laws as the source of deductive knowledge" (Sheppard 2001: 543) and furthermore remarks that in statistics too it is emphasized that "interpretive skills of the investigator and his or her ability to tell persuasive stories with spatial data" (ibid: 545) are an important part of quantitative research. Couper (2007) in a similar line of argument suggests that there might be commonalities between physical and human geography that are hidden by the language that is used.

Complexity science also helps to reconcile natural and social science discussions about determinism and voluntarism. The type of complexity referred to here is aggregate complexity that "attempts to access the holism and synergy resulting from the interaction of system components" (Manson 2001: 409). Complexity theory allows for the existence of functional relations, while at the same time including the possibility of emergence of new entities, which cannot be predicted ('the whole is more than the sum of its parts'). So to speak, while natural laws do not change new entities with new characteristics can evolve. While it would lead too far to grasp the whole discussion about complexity here, it was introduced as it enables to discuss the natural science – social science divide with more

[14] "Wie kann man die Kausalwirkungen von Gegebenheiten der materiellen Welt auf Akteure und gesellschaftliche Strukturen in nicht deterministischer Weise fassen?" Wardenga/Weichhart (2006)

[15] Gödel (1931) in his incompleteness theorem could prove that consistent arithmetic is incomplete, which is to say that we cannot derive all true options within one set of axioms. He further showed that the consistence of a system of axioms cannot be proved within the system itself.

[16] Apart from helping to think about relations, mathematics is creating numbers which often serve to give authority to claims. This is actually an important point to reflect on.

ease. Complexity theory also highlights that it depends on scale whether we see patterns or not (see Chapter 2.2.2).

What does this tell us about theories in natural and social science? Theories are interpretative models and provide specific representations of the world[17]. A theory provides glasses through which our view of the world is filtered, with a theory being a system of logical consistent statements about relations with regard to specific objects of investigation. As theories provide a specific way of perceiving the world they help to structure information and knowledge and provide guidance in the accumulation of information. Theories aim to prevent the failure of alchemists, but bear the danger of missing important aspects in a given setting, a fact which is used as an argument for grounded theory (Glaser/Strauss 1967). While there is a line of discussion that focuses on the explaining and thereby conceivably predictive potential of theories, often theories should rather been seen as heuristic tools

I want to claim here that it is important to bear the different starting points in natural and social science in mind, that however in day to day reasoning about socio-ecological dynamics, this difference is much less important.

2.2.1 Voluntarism and determinism: actor and structure

The actor-structure divide also centres on the role of determinism. Weber (2002) differentiated action (intentional acting) from behaviour (reaction), thereby emphasizing the role of active decision-making. While sometimes regularities (structures) might be dominant to an extent, that action might seem to be determined, this was for Weber just an empirical problem, not one of fundamental consequence for theories around action (in Schwinn 2006: 100). Action oriented social geography, as promoted by Werlen (1987) in the German speaking context, follows this line of argument. Other authors, out of whom Giddens (1984) is probably the best known in the Anglo-Saxon world, discussed to what extent actors are driven by unconsciously incorporated ideas or given structures. According to Giddens (1984) structures (rules and material resources that actors draw upon) are made and can be changed through repeated actions and practices and are thereby not determining action. Giddens talks of agency, in order to state, “that the individual is a perpetrator of events and he or she could have acted differently” (Dyck/Kearns 2006: 87).

Studies often either focus on decision-making actors or political-economic structures (or other constraints to choice) as the important factor to understand dynamics. Chowdhury/ Turner II (2006) ask about the implications of using this actor-structure binary by analysing the land-use strategies of mixed subsistence-market smallholder cultivators once by em-

[17] As Karl R. Popper (1969/1935) stated, we see what we know and the belief that we can start with pure observations alone, without anything in the nature of a theory, is absurd (see as well Poser 2001: 90).

phasising the freedom of decision of actors and once through the framing power of structures. They conclude that the approaches need to be joined in order to arrive at an adequate characterisation of the situation.

> "Agents do not make decisions independent of the political economic conditions in which they exist and the cultural and historical experiences that give rise to path-dependent constraints on their options. These conditions and experiences shape the very essence of household behaviour, and together with biophysical considerations, they mediate the decisions made. Likewise, these conditions are not immutable, and the household, being composed of reflexive agents, interprets and reshapes its circumstances […]. In some cases, external forces appear to overwhelm the household and elevate the role of structure in understanding the outcome of the coupled system. In others, the household displays considerable latitude in decision making, and the outcome cannot be understood absent attention to the household behaviour." Chowdhury/Turner II (2006: 303)

By acknowledging this mutual influence of action and structure instead of giving one of the two the overall power, a long argument can be cut short. The standpoint taken here is that dichotomies, as the dichotomy between actor and structure, are often used as rhetoric[18] and analytical tools. Social structures, as well as material reality propose a frame of action to us. It is, however, important to acknowledge that they do not determine action and that changes in the frame conditions are possible.

2.2.2 Scales and boundaries

For many, "scale is the fundamental conceptual challenge in the human and natural sciences" (Sayre 2009: 95); it can refer to objects, processes and their extent in space and/or time[19]. Howitt (2003) differentiates size, level and relation as aspects of scale[20]. Most important here is the discussion of scale as level. Scale as level asks at what scale of agglomeration phenomena (order or patterns) can be observed and understood (Gibson et al. 2000: 221). Using that as a starting point the issue of determinism and emergent properties comes into focus again. One question here is, whether, what is referred to as being an emergent property, is an ontological property or just not yet understood determinism. When choosing a specific scale to explain something, e.g. when framing something as being national or local, a judgment is made about which "spatial resolution [is] useful for comprehending processes and practices" (Herod 2009: 219).

[18] For example, de Bruijn et al. (2007) emphasise that individuals in Africa are actors in order to avoid victimization of Africans.

[19] The wwwOED (2008) defines scale as "the relative size or extent of something". Classical scales in human geography are for example: body, household, neighbourhood, city, region, state, and continent.

[20] Scale in the sense of size, refers to the measurement in standardised units (area, time period) and the size on a map relative to the actual size. Scale as relation is more about relations between "scalar units" that do not necessarily belong to the same larger unit.

With regards to an explanation of socio-ecological patterns and dynamics, it is necessary to be clear about the boundaries of the studied area. Choosing the boundaries will also influence the scale on which the analysis takes place. Drawing borders can take place differently. It is possible to either try to draw borders based on scientific criteria, or to analyse where people draw boundaries, for example where they see their potential to influence happenings, through their own actions, influencing the actions of others and influencing the broader setting (e.g. prices of products, laws, codes of conduct). The construction of borders influences not only how we evaluate and think about something, it also affects our perception on where we can and/or want to take action. Chapter 5.1 therefore describes how the borders of the study area were defined.

The chosen level of analysis, will further influence what is seen as the external and therefore as the 'black-box'. However, for efforts of regulation to have success, knowledge on the processes going on at the other levels is important. The current approach taken in this regard is to choose one scale of analysis but also consider the processes on the levels above and below (Easterling/Polsky 2004: 70). Similarly this thesis focuses on the individual, household and community level, however takes into account the influence of external factors and actors. It is seen as important to discuss where, when, and why boundaries of influence are drawn, and how the construction of different boundaries influences evaluation and therefore decision-making.

2.3 *Society - nature relations – different conceptions*

To show how the relation between nature and the society is conceptualised in different approaches, mindmaps can be used (for an elaboration of mindmaps see Glaser (2006) or the Annex 10.1). According to Glaser (2006) ecocentric mindmaps focus on the value of and the limits posed by nature. Human action is conceptualized exclusively in terms of impact on nature (ibid: 124). Anthropocentric mindmaps in the extreme case regard nature just through the lenses of the society. An understanding of nature is seen as largely irrelevant (ibid: 127). Interdisciplinary mindmaps try to understand the processes in the natural as well as the social sphere, by analysing the "social causes of environmental dynamics, as well as the environmental causes of social change" (ibid: 130).

Two different ways of talking about SNR are presented here, in order to show the diversity of the discussion hidden behind the label SNR. First the focus is on system approaches, as the approach by the Institute for Social Ecology (ISOE) in Frankfurt (they basically are close to using an interdisciplinary mindmap). Secondly the approach by Görg, who uses the same vocabulary but basically conceptualises the SNR using a more anthropocentric mindmap, is introduced.

2.3.1 System approaches – The example of the ISOE[21]

In the following I can only sketch some aspects of the approach and theoretical discussions of the ISOE and do not claim that I have grasped everything of the broad field of research that they have covered, neither all their lines of discussion. However, I want to present some of their basic ideas, to demonstrate some general problems that exist within this field of research.

The goal of the ISOE , is to bridge the artificial divide between nature and society and to combine natural science and social science knowledge and methods in order to holistically analyse how people relate to their natural and social environment and to understand the complex interaction between society and nature (Becker/Jahn 2006: 77). Knowledge on system and process is to be provided (ibid: 25) as well as an analysis of existing modes of regulations and their consequences (ibid: 251). For the ISOE, social science and natural science viewpoints are complementary, as well as effect (material-energetic) and meaning (communicative-symbolic). Becker/Jahn (2006) see the relation of individuals and society to their environment as being regulated on a material basis and symbolized culturally.

Social Ecology is defined as:

> "[…] the science of the societal relations to nature. It analyses the manifestations of, changes in and formability of those relations in theory and in practice in an integrative way."[22] Becker/Jahn (2006: 86; own translation)

The aim of the research is to solve concrete societal problems in the regulation of the relation between nature and society in a given region (Jahn 2008). The aim of the analysis is to secure the potential of societies to reproduce and to maintain their natural resource base; so to say it thrives for the normative goal of sustainability. However, it is stated that the approach could also be applied under different normative goals (Becker/Jahn 2006: 237f & 249). Regulation analysis deals with the following questions: (a) what is to be regulated with which goal, (b) who regulates and how and (c) what is the influence of social, cultural and gender specific differentiations in the evaluation and the acceptance of proposals for solution (ibid: 65).

The goal of the ISOE is not to present a fully established theory, but rather to present a network of concepts and notions. Analyses within the ISOE however rely on a functional representation of the socio-ecological setting, which is referred to as socio-ecological system (SES). One goal of the analysis is to identify those elements that can be changed

[21] www.isoe.de

[22] "Soziale Ökologie ist die Wissenschaft von den gesellschaftlichen Naturverhältnissen. Sie untersucht theoretisch und empirisch deren Formen, Veränderungen und Gestaltungsmöglichkeiten in der gesellschaftlichen Praxis in einer integrativen Perspektive." Becker/Jahn (2006: 86)

through new forms of regulation (ibid: 433). The most important steps are seen to be (a) identification of the functional parts, (b) identification of the causal relations and (c) identification of feedback loops (ibid: 257). As a consequence of the feedback loops, control is seen as being limited, so that Becker/Jahn argue for approaches of middle range, that focus on adaptivity and flexibility (ibid: 266-268).

Research topics at the ISOE (ibid: 341ff) range from water resource management (social-ecological modelling, scenario development, formalised decision support, identification of processes of transformation), to consumption, nutrition, mobility cultures (discourses, politics, planning) and supply systems (a SES that can serve as a mediator between society and nature consisting of a material-energetic and a cultural symbolic dimension).

The studies that have been conducted under the umbrella of the ISOE, accumulate different aspects that are analysed together mainly with regard to the solution of concrete societal questions (ibid: 77). Talking about systems for them however implies that ways of reasonably influencing what is going to happen in a setting can be found. Stating that it is not possible to talk about cause-effect relations, it is nevertheless tried to identify the main elements to understand dynamics (ibid: 341-446). The ISOE does not present a global theory. Instead they discuss a very wide variety of existing theories and their relevance for the study of SESs. Basically their analysis shows how difficult it is to achieve a real holistic understanding.

2.3.2 Regulation of societal relations to nature according to Görg

In contrast to the ISOE that basically focuses on the identification of local solutions for societally perceived problems, Görg (1998) approaches the question of SNR and regulation from a focus on power. While the current goal of regulation analysis at the ISOE is to contribute to sustainable development, Görg's focus (1998) is on the hidden logic behind regulation. According to his understanding, regulation is a theory of middle range that refers to the intrinsic logic through which a mode of production is reproduced and thereby stabilised (Görg 2003: 121).

Görg questions current conceptions and problem definitions with regard to SNR, as well as dominant perceptions of causal relations (Görg 1998). He uses the example of biodiversity to show that the current regulation of biodiversity is closely tied to the constitution of this nature, as an element of capitalistic globalisation (ibid: 18). His argument is centred on the statement that current efforts of regulation aim at control over biological resources through the creation of institutions such as money, juridical or political forms of regulation including

private property and public decision-making structures (ibid: 18). He pleads for the necessity to be critical about the normative assumptions behind the striving for a specific goal[23].

Görg's analysis consequently focuses on an understanding of institutions as centres of regulation (Görg 2002 cited in Görg 2003: 199). The following aspects are taken into consideration: the strategic action of social actors, socio-economic processes, influence of values and norms, symbolic institutions and structural restraints (Görg 2003: 126). Görg states that the study of power structures is key for understanding developments in resource management. His approach is therefore similar to the one of political ecology. While his insights point out important aspects to understand dynamics in socio-ecological settings, he almost entirely ignores the natural side of regulation, wherefore he does not provide a solution for the quest of finding a new holistic way of representing SNR.

2.4 *Discussion and intermediary summary*

What have we learned about the possibilities of interdisciplinary approaches so far? With regard to the society – nature differentiation it is suggested to consider when and in which way this differentiation becomes important, by analysing the following questions: (a) what is seen or presented as 'natural' or 'non-natural'? And how does this influence decisions? and (b) when, where and how do changes in what is seen as the natural influence society (and vice versa)?

Concerning dynamics, I started with a discussion of the importance of a deterministic versus a non-deterministic perspective in natural and social science. The longer I thought about it and the more I read, the less important this differentiation into natural and social seemed to me when talking about socio-ecological dynamics. For the following reasons: (a) While explanation and the discovery of universal regularities is presented as the success of natural science as it allows prediction, in the real world this success is relativized. In the end, laws have only limited (if not only trivial) predictive value if they are used to make predictions on a larger scale with many interacting processes. And (b) social scientists, while stating that they do not want to discover laws and emphasise the importance of contexts, they often try to identify patterns and regularities that can be used to analyse similar cases. Furthermore, while stating that social science is focusing on an interpretative understanding, "'the research methods […] tend to work on the assumption that the world is properly to be understood as a set of *fairly specific, determinate, and more or less identifiable processes*" (Law 2004: 5). One solution for the problem of having to describe patterns, but not wanting to be seen as deterministic, is not to claim that identified patterns, have global significance in the sense of nomothetic laws, nor to state that they are fixed for eter-

[23] In contrast to that, Becker/Jahn use a normatively given goal as their starting point.

nity (see as well Johnston 2008). Another way of dealing with this problem would be to refer to the represented patterns as *ideal cases*[24] or averages[25].

With regard to the possibility of combining the perspectives in order to ask a new question and thereby develop new perspectives on the world; it is hypothesised here that high expectations on such a possibility might often blur rather than help to clarify what an interdisciplinary approach can offer. Scheringer/Jäger (2008: 33) argue that it has not yet been answered whether a holistic and integrative perspective is necessary. According to them there are scientific questions which cannot be answered and environmental research would gain from acknowledging those unanswerable questions instead of trying to solve them (ibid: 34). I agree with Donaldson et al. (2010) who state that it is misplaced to assume that a newly synthesised object would emerge out of interdisciplinarity and that it might be better to pay tribute to the diversity of views:

> "Sometimes the best way to tackle the mess of an interdisciplinary object is to acknowledge its multiplicity and not try to reduce that through synthesis." Donaldson et al. (2010: 1533f)

The most important feature of interdisciplinary research could be that it opens up the framing of problems and helps to develop different perspectives (ibid: 1527-1530).

The general position taken here is that disciplines should be seen as complementary ways of viewing the world and that discussions would benefit from challenging rapidly stated differences. Acknowledging this would open the way for discussions less burdened by ideological aspirations. It would avoid empty phrases promoting a new interdisciplinary science, but rather emphasise the importance of multiple perspectives. And lastly, it might also help to better differentiate between scientific theoretical problems and societal pragmatic problems.

After the discussion of some key concepts in order to discuss SNR in Chapter 3, Chapter 4 presents the summary and consequences of the conceptual thoughts for the case study.

[24] Based on Weber's (1988) argument for the *Idealtyp* as a construct which allows comparison.

[25] In this line of argument, Fotheringham states that "we cannot hope to model the actions of each human being, [however] the actions of humans in aggregate are often quite predictable" (Fotheringham 2006: 242).

3 Risk, resilience and vulnerability – a discussion of current terms

> "Be mindful of the multiplicity of meanings." Sneddon (2000)

This chapter engages in critically reviewing the terms: risk, resilience and vulnerability. It scrutinises what they are pointing at and what their role is for evaluation and decision-making. The focus is on these terms as (a) they are widely used in natural, as well as social science, especially when reasoning about socio-ecological crisis and (b) as especially risk and resilience are seen as two terms which allow to reason about dynamics in the socio-ecological setting in the study area. The fact that different interpretations of those terms exist, is widely acknowledged[26], however conscious use of them is hardly ever made, and the meaning with which they are used can change from one sentence to the next even in scientific literature. This complicates building up consistent arguments around these terms.

Being conscious about the use of terms is necessary, as they allow a situation to be described, which is a prerequisite for exchanging views, evaluating situations and taking decisions. Substantial debates have been going on in interdisciplinary research groups as to whether universal definitions of terms have to be found: Some argue that it is necessary to find common terms, others doubt that this is possible and argue for the simple creation of clarity and awareness about the multiple definitions and assumptions behind a term (Feichtinger et al. 2004: 15). Equally Harrison et al. (2006) state:

> "Definitional clarity is important to this debate, but definitional proscription is not. I do not think it is desirable, nor indeed possible, to settle the meaning of these categories, but as researchers, we have a responsibility to be clear about how we choose to interpret them."

While there certainly is truth in this statement, at the same time a higher consensus on the use of terms would be desirable. While not assuming that this text will come up with the ultimate definition that everybody would adhere to thereafter, some basic structuring is suggested. The goal of this chapter is two-fold: (a) show the multitude of definitions of, and ascriptions to, risk and resilience and (b) to suggest a useful differentiation of the terms.

3.1 *Risk*

Risk has been defined and approached differently in different disciplines. It is highly debated, not only as a problem for society, but also as a concept (e.g. Hampel 2006). In day-to-day language, risk is associated with potential harm and danger; on closer scrutiny how-

[26] A consistent argument on the use of these terms can only be achieved by applying "more discipline when using them" (as was stated by a discussant at a conference on *risk*).

ever, it has further connotations. Risk can be used to point at chance' or be seen as the opposite of safety or security (thereby referring to an absence of a probability to get harmed) (Weichhart 2007). Renn (2008: 55) talks of the following semantic images of risk: "pending danger", "stroke of fate", "personal thrill", and "gamble".

What do they have in common? As a general starting point, risk can be seen as being about the relation of the known to the unknown aspects of future (Webster 2004). It refers to the future, and the extent to which this future can be foreseen, predicted or influenced. The starting point of what is considered to be 'risk talk' was a belief in the human capacity to meaningfully take into account what could happen in the future. While in the past the future was associated with fate and fortune, or in other words 'to be in God's hands'[27], nowadays many aspects of life are seen as being manageable and under our control (see Taylor-Gooby/Zinn (2006), or Bernstein (1996) for a detailed history of risk').

> "The revolutionary idea that defines the boundary between modern times and the past is the mastery of risk: the notion that the future is more than a whim of gods and, that men and women are not passive before nature." Bernstein (1996: 1)

While therefore risk is often seen as related to modern societies, Macamo (2008: 90) argues that "the ability to produce risk is an anthropological constant", in the sense that individuals base their actions on assumptions about the way the world is and thereby have some ideas about the potential outcome of their actions.

I see two strands of discussion here. One is about calculation and how far quantitative descriptions can lead, and the other is about decision-making and its prerequisites in general. These aspects are discussed in the following sections.

3.1.1 Calculation – and its critique

> "Not everything that can be counted counts and not everything that counts can be counted." Often attributed to Albert Einstein (no date, no source) by others attributed to Cameron (1963: 13)[28]

To a great extent risk analyses are associated with calculations of probabilities. The calculation of likelihoods (and magnitudes) and the basic presumption that quantitative utilitarian trade-offs are possible was for some time the main focus to mitigate the problem of the unknown. The insurance system can be seen as an outcome of such a way of thinking (Fox 1999). However, in the 20th century the incommensurability of many events became clearer (Stirling 2003). Problems with calculations as well as failure of technologies and institutions

[27] What is nature for some is referral to the religious for others; e.g. people use the expression "work of God" simply to state that things happened outside of one's own control.

[28] http://quoteinvestigator.com/2010/05/26/everything-counts-einstein/ (accessed last in Nov 2013)

of risk management gave rise to the concern that it is impossible to eliminate uncertainty[29]. The science and security optimism[30] was challenged and discussions focused on possible events for which likelihoods can no longer be calculated, as well as on the subjectivity of assessments of risks.

> "Our current concerns regarding risk and uncertainty are as much an effect of the evident limits of control by science and technology as they are an outcome of a cultural perspective which tends to interpret uncertainties as in principle controllable by rationality." Zinn/Taylor-Gooby (2006: 46)

Apart from problems with calculations of probabilities and magnitude, risk assessments are expected to assess the expected outcome or damage. The problem herewith is that it is hard to compare different risks by simply assigning one value to them, e.g. high cost – low probability risks (e.g. a nuclear disaster) with high probability-low cost risks (e.g. a car accident). It is especially difficult to assign a quantitative value to the live (or death) of a human being. Discussions about risks would often profit from a more conscious differentiation between these two (see e.g. Stirling 2003). When arguing about risk it is necessary to reflect on whether the discussion is around the possibility of knowing or about an evaluation of the potential outcome (damage).

Despite those difficulties, risk-calculations should not be abandoned. They are one perspective on the world, which can be seen as providing a tool for discussing and comparing different views, as they put concrete numbers on things. In this thesis I will use the term 'quantitative risk' when referring calculations of probability or a combination of probability and immediate damage.

3.1.2 On the perception and construction of risks

The challenges to the rational approach of risk calculation can be seen as the starting point of risk sociology (Zinn 2006) and perception research[31].

Risk perception research deals with the factors that are influencing the evaluation of dangers. For example dangers that have a natural cause are much more likely to be accepted than dangers caused by human activity (Lupton 1999), individuals are much more concerned about risks imposed on them involuntarily than about risks taken voluntarily (Slovic 2000), familiar dangers are regarded as being less dangerous than unfamiliar dangers, and so on. As risk perception thus can be said to be influenced by factors such as trust and

[29] According to Voss (2003) there are even cases in which additional information increases the amount of possibilities and renders decisions-making even more complicated.

[30] e.g. Baumann »Ende der Eindeutigkeit« (1992) and Kaufmann already in 1973 »Unsicherheit als Zeitdiagnose«

[31] For an overview about social theory and risk see e.g. Zinn (2006) and Renn (2008).

emotion (Zinn/Taylor-Goby 2006:47), much of the research of the 1970s and 1980s tried to improve the communication of danger to the public (e.g. Slovic 2000), in order to reach optimal ground for a most objective decision (avoiding panic or carelessness) (Loefstedt 2003). Beck (1986) also discusses the importance of communication in order to influence perceptions of risks. Those approaches can, to some extent, still be attributed to the 'natural science sphere', aiming at finding concrete and universally applicable explanations for different perceptions of risk.

The constructivist position in contrast, questions the possibility of developing one overall valid view and analyses discourses within the society that translate the 'given' and make it relevant for decision-making and action (see e.g. Krüger/Macamo 2003). Cultural approaches deal with the cultural specific construction of risk (Boholm 2003, Douglas 1966, Douglas 1985, Douglas/Wildavsky 1982, Tulloch/Lupton 2003). The cultural constructivist approach points to the different value assumptions (normativity) and preferences behind judgements, in order to overcome the naiveté of the technical scientific evaluation of risk (Fox 1999: 17). Understanding what is seen as risky within a society can tell us a lot about the societies themselves (Lupton 1999: 14).

Risk constructions in this regard can also be seen as part of the game to legitimize power and a way to shape, control and govern populations (Foucault 1991). While all discourses have the potential to discharge authority, risk is a powerful notion, as it addresses the fear of people. It can be applied to many domains, and therefore can be widely used to manipulate. This does not only apply to labelling something as a risk, but also to labelling something as a disaster (see Chapter 3.1.4 for a conceptual and Chapter 7.4. for a practical discussion).

3.1.3 Decision-making processes and routines

Given the above, it is argued that it is important to pay attention to the role of presentations of specific problems for decision-making processes. The differentiation by Luhmann (2003) between danger and risk most prominently points to the issue of decision-making. He conceptualised danger as the opposite of risk. For him, risk pointed to active decision-making and the adjustment of action to a potential future event. He referred to external threats as dangers and to internal (and thus manageable) threats as risks. Internalisation according to Luhmann, takes place through conscious decision-making when taking up a danger. What is not anticipated and taken into consideration by e.g. an individual or a society therefore is a danger and not a risk. It is important to know that the possibility to make decisions does not only refer to the genesis of a danger (e.g. building a nuclear power plant) but also to decisions that will change the potential impact of hazards. In this regard Luhmann says that, with the invention of umbrellas the danger of getting wet because of rain was trans-

formed into a risk, as people could now decide whether they take an umbrella when leaving the house (Luhmann 2008: 363)[32].

The differentiation between danger and risk is seen as being useful because it brings some clarity to the often-blurred use of the notion of risk, as the example below demonstrates. The sentence:

> The research examines perceptions of, and responses to, **risk,** in a range of areas.

In the words of Luhmann can be rephrased as:

> The research examines perceptions of, and responses **to, possible negative events in the future / the un-predictability of the future** in a range of areas.

And the sentence:

> Risks are socially constructed **and objective** at the same time.

Can be reformulated to:

> Risks are socially constructed but at the same time they are **replying to threats**.

Similarly, instead of talking about 'taking risk' and 'experiencing risk', it would be better to talk about 'taking risk' and 'facing materialising threats'.

Focusing on decision-making involves asking whether people have (or realise that they have) a choice (see e.g. Wilkinson 2009:77f). In case people have no choice, or do not realise that they have a choice it might make more sense to term what they do as routines instead of calling it risk-taking[33]. Social science is concerned with the question of 'why do people act the way they do'. Taking this as a starting point, the focus of risk analysis would have to be to understand the alternatives to their decisions and actions that people are aware of. And as well to understand who has the power to take decisions. Routines allow trying to understand what people do without questioning it further. With regard to changes the question thereby is: are people not aware of the changes and therefore still follow the old routines, or are they aware of the changes but do not have the necessary information to take confident decisions and thereby feel like relying on external decisions. In contrast to taking risks or following routines, uncertainty could be used in this context, to point at situations in which people do not feel like they can make confident decisions, because of a lack

[32] „Wenn es Regenschirme gibt, kann man nicht mehr risikofrei leben: Die Gefahr, daß man durch Regen naß wird, wird zum Risiko, das man eingeht, wenn man den Regenschirm nicht mitnimmt. Aber wenn man ihn mitnimmt, läuft man das Risiko, ihn irgendwo liegenzulassen." Luhmann (2008: 363)

[33] When asking a lecturer from Maseno University at the Lake Victoria, who took part at a conference about Risk in Africa, whether fishing at the LVB was risky, replied: "it is not a risk, it is a livelihood." (RO_RK_45F)

of understanding of on-going or introduced changes[34]. The notion of risk has a forward-looking perspective. The notion of disaster refers to the situation after an event/threat afflicted a society. Similar to "risk", different definitions about disaster exist. The following chapter will briefly introduce some disaster definitions. The impact of specific definitions on the way people evaluate a situation will then be discussed in Chapter 7.4.

3.1.4 Risk, routines and disasters

There is no universal definition of a disaster as disasters are discussed in different disciplines. While some definitions focus on quantitative measures of the damage done by an event others focus more qualitatively on the capacity of the societies to deal with the situation after a specific hazard occurred.

For a disaster to be entered into the EM-Dat database[35] at least one of the following criteria must be fulfilled: (a) 10 or more people reported killed, (b) 100 people reported affected, (c) declaration of a state of emergency and (d) call for international assistance[36].

More qualitatively, Stallings (2005: 263) defines disaster as "a social situation characterized by non-routine." Thereby the word routine also includes exception routines (Krüger/Macamo 2003, Clausen/Dombrowsky 1983, Kreps 1998). What is emphasised in this definition is the feeling of uncertainty within a society, when facing a completely new situation. Chapter 7.4 deals with the question to which extent the floods in the Nyando Basin can be called a disaster and thereby discusses the different definitions of disasters and the implications this has in practice.

The concepts of resilience and vulnerability are used alongside disaster and risk. They both are linked to the impact that an (imagined) event has on a given setting. What this means in detail and what implications a resilience or vulnerability perspective has on the way disturbances or (extreme) events are dealt with and thereby will impact on the SNR will be discussed in the following chapter.

3.2 *Resilience and vulnerability*

They have often been seen as counterparts; however this misses the core of the terms, as is argued below. While the focus in the thesis will be on resilience, vulnerability is used here for sharpening the concept of resilience.

[34] Bonß (1995) saw risk calculation as a specific modern pattern of dealing with uncertainty; a specific way of constructing certainty; its strength being the promise of a fabrication of accountability (ibid:18 & 59).

[35] http://www.em-dat.net/criteria.htm

[36] This aspect actually points to the necessity to define borders in order to make a judgement whether something is a disaster. Or otherwise put, it is necessary to state whether something is an individual, local, regional or international disaster.

3.2.1 Vulnerability

Since the International Decade for Natural Disaster Reduction (IDNDR) in the 1990s vulnerability reduction is seen as a main goal to reduce the probability of disasters. In the late 60s and 70s, disaster research had a technocratic approach and focused mainly on a natural science understanding of hazards – which is to say, on an analysis of probability, magnitudes, frequency, scope, duration and probable times of occurrence of threats. The term vulnerability entered the disaster discourse in the 1970s with the article of O'Keefe et al. (1976) titled: "Taking the naturalness out of natural disasters". They pointed to the fact, that the natural event alone does not determine the impact of a disaster, but rather the social conditions of the affected society. The focus shifted from the trigger event (the materialising hazard) to the receiver unit (the vulnerable entity). It was Sen (1981) who made the concept famous with her entitlements theory, showing that even during periods of famine food is still available in the markets, but people cannot afford it. The focus on people's entitlements to acquire food emphasised that socio-political conditions play an important role in understanding who is affected by hazards (Chambers 1989, Bohle/Watts 1993; Bohle et al. 1994, Wisner et al. 2003/1994). The vulnerability concept thereby goes along with an emphasis on a bottom-up approach focusing on the life worlds of individuals (Chambers 1997).

While the starting point for vulnerability research was quite socio-political, with elaboration and modification of the concept, the focus widened and ended in the sustainable livelihoods approach (Carney et al. 1999), analysing the ecological, socio-cultural and political-economic conditions influencing vulnerability (Downing 1993; Bohle et al. 1994; Kasperson/Kasperson 1995).

For an overview of different concepts of vulnerability, see for example Anderson (1989) or Cannon (1994). Definitions of vulnerability differ specifically with regards to the time-frame (sometimes adaptation or recovery are included), the definitions are, among others:

> "... likelihood and scale of damage from the impact of a given hazard." UNDP (2004)
>
> "… capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (an extreme natural event or process)." Wisner et al. (2003/1994: 11)

Further, some definitions of vulnerability include exposure to a threat as a component of vulnerability, while in other definitions exposure is referred to as external. In the latter case, a person could be seen as being vulnerable e.g. to floods, even though he would not live in a flood prone area and therefore would never be exposed. This approach is seen as being more useful here, as it makes results easier to compare. As a consequence, when discussing the vulnerability of people, the kind of threat to which the vulnerability assessment refers to, needs to be defined.

Some have argued that the concept of vulnerability should focus more on the capacity to recover. For conceptual clarity however, it makes sense to consider vulnerability solely as focusing on the aspect of being harmed; and thereby differentiating it from coping and adaptation. It has also been heatedly discussed whether resilience is the flip-side of vulnerability (for an overview see e.g. Folke (2006)). This position is not supported here as is argued below.

3.2.2 Resilience

Resilience comes from the Latin word 'resilio', meaning 'to jump back'. The term resilience emerged in ecology in the early 1970s[37]. Holling (1973) defined ecological resilience as the magnitude of disturbance that can be absorbed by a system while still returning to the same equilibrium/initial state. One measure of resilience was the time it took an ecological system to return back to its initial state after disturbance.

Resilience carries along the positively viewed connotations of strength and endurance (Folke et al. 2003: 352). The stability of an ecosystem is for example seen as providing flexibility for trying out different management options without completely losing control (Berkes et al. 2003).

Current definitions of resilience, often refer to coupled SESs and include issues of reorganisation, change and adaptation (see Folke (2006) for a detailed review):

> "Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks." Walker et al. (2004: 2)

> "The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure." UN/ISDR (2004: 6)

> "Resilience refers to the ability of a system, from individual people to whole economies, to hold together and maintain their ability to function in the face of change and shocks from the outside." Hopkins (2008: 12)

The problem with these definitions is the relationship between change and stability. When using resilience to discuss the opportunity of recombination and change, the original focus of the term is actually almost reversed, because the return to the starting point is no longer obligatory.

The reason for the confusion can most clearly be seen in the introduction of the term 'identity' and by using the concept in order to discuss coupled SESs. When a household turns from pastoralism to sedentary agriculture, it can be seen as being resilient in case the new

[37] in social science it was applied only later

activity will allow the household to take care of its members. However, the turn to sedentary agriculture might also be seen as a loss of resilience, in case the ability to stick to the old lifestyle is seen as decisive for the household's identity. One way of dealing with this shortcoming is to differentiate between maintaining structure and maintaining function[38].

What further is confusing is, that when talking about SES resilience, the focus for the measurement of resilience is often only on one part of the system, which is normally associated with human survival (so to say: societal resilience), even if the ecological system is losing its capacity to deal with disturbances.

> "Systems may be ecologically resilient but socially undesirable, or they may be socially resilient but degrade their environment. Here, we are concerned with the combined systems of humans and nature, with emphasis on social-ecological resilience. We are concerned with management that secures the capacity of ecosystems to sustain societal development and progress with essential ecosystem services." Folke et al. (2003: 354)

With change being an important aspect of current societies, in order to constructively bring together stability, change and adaptation, two paths can be followed: One is to only bother about the outcome, e.g. human survival; "the capacity to achieve a continued existence" (Folke et al. 2003). If this is the case, then resilience is defined (normatively) by what is seen as desirable (or the important part of the 'identity') beforehand. Apart from that, everything is allowed to change (composition and structure of society, economy and ecology). The other possibility is to consider the speed at which order (characterised by regularities or some sort of stability) is achieved again; which comes close to the argument of Gallopin for whom resilience has to refer to multiple stability domains.

> "When the concept of resilience is unlinked from the notion of multistability, it becomes very difficult to distinguish it from structural stability, or even from local stability or adaptive capacity." Gallopín (2006: 299)

Either way, resilience has a focus on long-term effects and shifts the focus away from the immediate impact of an extreme event. By looking at stability, resilience also draws attention to the relationship of gradual changes (e.g. small-scale erosion) to sudden and difficult to reverse change (e.g. landslides) (Folke 2006, Scheffer et al. 2001). It draws attention to thresholds and points at the necessity to recognize windows of potential transformation. While humans normally interfere in seemingly stable environments and exploitation strategies are often based on trust in this stability, the probability of "unforeseen and unintended effects" (Weisz et al. 2001: 208) increases with increasing impact of the human race.

[38] Leach et al. (2010) talk about robustness in case the function is maintained and about resilience in case the structure is maintained.

What are the practical implications of a resilience focus for the management of SES? Good management implies providing stability, accepting variability and at the same time allowing for change. In my opinion, the resilience approach offers the following benefits for practical implementation[39]: (a) reflect on which disturbances (extreme events) are an essential part of a given setting, (b) be aware that long-term trends can make changes necessary or probable and (c) pay attention to the need of keeping manoeuvring capacity to deal with disturbances and with change instead of trying to control it (knowledge about dynamics, buffers to cope with shocks and diversity of resources and strategies are seen as helping to deal with variability and change).

If a system has already moved into an undesirable regime and efforts to keep away from it are failing, there comes a point when transformation is the only option in order to avoid unnecessary loss or damage.

> "When transformation is the only option, the sooner it is recognized, accepted and acted on, the lower are the transaction costs and the higher the likelihood of success." Walker/Salt (2006: 124)

The following sub-chapter will synthesise the arguments around the relation of vulnerability and resilience.

3.2.3 Vulnerability and resilience: current state vs. long-term performance

Vulnerability can be seen as a rather pragmatic concept, concerned with the immediate damage as a consequence of an event ("the susceptibility to harm" Adger (2006: 268)). Resilience is more related to abstract assumptions of order and stability and, in contrast to vulnerability, attempts to understand the overall behaviour of a system over a longer period of time.

For example, for individuals, it can be argued that the human body can be seen as vulnerable and resilient at the same time. It can be harmed or attract a disease (vulnerable), but recover and return to the initial state (resilient). Using that as a starting point, resilience allows perceiving stability or order within variability. It opens the floor for an understanding of dynamics and the analysis of processes in which destructive extreme events can be (an essential) part of the system's functioning and not a symptom of failure (the fire disturbance regime is probably the most prominent example (e.g. Pringle 1979)).

> "Within each domain the system's state may fluctuate widely, but if it tends to stay within the boundaries of the domain, the system is resilient." Gallopín (2006: 298)

While it often is argued, that vulnerability should be seen as coming from a loss of resilience, it is stated here, that it makes more sense to differentiate the two terms by saying

[39] Inspired by Berkes (2007), Carpenter et al. (2009) and Folke et al. (2003).

that the loss of resilience of the environment is one of the many hazards that societies can be vulnerable to.

The following chapter summarises the arguments from Chapter 2 and 3 and presents the questions for the empirical case study.

4 Consequences and approach for the empirical case study

The purpose of the previous chapters was to present current debates on the study of SNR and to discuss some of the problems related to that. It was further tried to bring lucidity to the society-nature dichotomy and to specify some of the concepts used in this context (risk and resilience).

It is suggested here to become more modest when talking about interdisciplinary science, and basically seeing it as pointing to the limits of scientific knowledge in providing clear answers. As there is no single truth and different perspectives will always prevail, the main feature of interdisciplinary research is seen as accepting different views as complementary and not as competing. Interdisciplinary work should also create awareness about the different meanings behind terms in order to represent situations.

Consequently, the empirical part tries to present the whole at a glance. Different perspectives are used to scrutinize the situation, thereby following Donaldson et al. (2010) who argue for the development of lists and tool boxes for interdisciplinary projects, as they suggest openness and because they can be used to get a broad picture of the situation (playing around, allowing informed trial and error).

> „ A list is not like a classification, it does not have to have boundaries, it does not have to rigidly identify and categorise all that it contains and exclude that which does not fit a category. A list is never really closed by anything other than choice or contingency and could always have something else added to it. [...] In both the report and the exhibition, flooding retained its multiplicity; it was not synthesised into a single, underlying problem.“ Donaldson et al. (2010: 1533)

On an empirical level the focus is on the SNR in the Lower River Nyando Basin (LNB) in Kenya. It will be analysed which factors are influencing agricultural activities and how resilience considerations change the way that those activities are evaluated. On a conceptual side the focus is on the use and applicability of the words risk, disaster and resilience. It is not tried to synthesize the different perspectives by identifying key factors, but rather to deal with the social-ecological problems in the research area by acknowledging the diversity of aspects.

4.1 *Landscapes and actors – Outline of the empirical study*

> "Although power and structure have a great influence on what can be achieved, the stage is dead without the actors." Richards (1993: 71)

A landscape (Donaldson et al. 2010, Görg 2007, Wesselink 2008) as well as an actor perspective will be used in order to describe the socio-ecological setting and changes. Görg argues for the use of landscape as a common epistemological object, in order to address "the unification of societal production and natural-spatial conditions" (Görg 2007: 959). Despite all critique that has been brought forward, Görg sees the landscape concept as representing a starting point for "an applied, interdisciplinary environmental research, […] particularly, for research in environmental governance" (ibid: 955). According to him, landscape offers a meso-level, between the local and the global (ibid: 964). Following Donaldson et al. (2010) the location of the research will be used as the platform to discuss the different perspectives and aspects[40].

Chapter 5 briefly discusses the problems of identifying the boundaries of the landscape under observation and what implications the selection of a specific entity and thereby scale of observation has. After describing the research area from this meso-level, the thesis focuses on the perceptions and the actions of the involved people. In the LNB, the major part of the population still depends on agriculture as a main source of livelihood in the region, although other sources of income are available as well. In the region, numerous efforts have been made during the past 40 years to achieve sustainable rural development through agricultural growth[41]; which is why agriculture will be in the centre of attention (Chapter 6). As flooding is a common event in the region, a closer look at the role and influence of climate extremes will be taken in Chapter 7.

By doing that it will be tried to get a holistic overview of the changes that have been going on in the SES and the impact they had on risk and resilience. Attention will be given to variability and trends, the role of the nature-society divide and the role of external versus internal influences.

4.2 *Data collection and methods for the empirical research*

Data collection and field work took place from September 2005 to July 2006. A short return to the field took place at the end of 2010. The ecological and landscape level analysis is based on a literature review. Grey literature, specifically on development aid projects and

[40] Learning to live with change includes having the capacity to discuss conflicting claims (Nelson et al. 2007).

[41] Despite the high density of development organisations poverty increased; a trend that can be observed in many other countries (e.g. Kothari/Minogue 2002: 3).

district development, was collected in the field. Intensive analysis of numerous studies done by the World Agroforestry Centre (ICRAF[42]) furthermore took place.

For the analysis of the local understanding of the situation a mixture of qualitative methods was used. During the whole time participatory observation as 'close participation' ("dichte Teilnahme" (Spittler 2001)) was applied where possible, in order to understand people's daily lives and routines. However, given the broad character of the study, close participation could only be realised in a few cases. The broad character of the study is justified, for only in that way an understanding of the process of the whole Lower River Nyando Basin could be striven for.

Narrative (oral narratives and specifically oral history of floods and other significant events) and semi-structured interviews were conducted. Key interviews took place with scientists, chiefs, the District Development Officer (DDO), the District Agricultural Officer (DAO), the District Environmental Officers (DEO), the Kenyan Red Cross Society (KRCS), village elders, development aid workers and stakeholders in disaster risk management. Data was collected concerning their perception of the main problems and the on-going environmental changes and the coping strategies that they apply and how they changed (solidarity, relief aid, diversification, migration). Another focus was on floods, droughts and the most significant events in the area. For the interviews with professionals no interpreter was needed. For the discussion with the communities a local interpreter who had lots of experience in development and research projects was assisting. He was involved in farming activities himself as well and knew most parts of the study area.

Four group discussions (GD), each for two days, including some elements of participatory appraisals (like timelines and resource maps) took place, in which the history of the area was discussed, the important events, the changes that took place as well as a discussion of the problems affecting the villages. Through a discussion of the prioritisation of the problems it was tried to develop a deeper understanding of the problems that the communities face. The GD took place in the local language and where recorded. They were later on transcribed and translated in the field. Translations could not take care of semantic subtleties. Furthermore, it could not pay attention to different groups (e.g. men or women, old or young) taking part in the discussion

Additionally a five-page questionnaire was administered to around 20 households per village (82 in total). In each of these villages a stratified random sample of 20 households was selected and interviewed (the stratification was based on the stages of wealth which had

[42] The old name was: International Centre for Research in Agroforestry

been identified earlier within the communities), in order to make sure that a broad range of households were interviewed.

The analysis of the interviews was done with MaxQDA in order to identify the common streams of arguments. Categories for the coding were developed by paraphrasing the re-occurring themes. The questionnaires were used to add some quantitative information to the analysis of the group discussions and the interviews.

While in the thesis I refer to the 'farmers' or 'the people' in a quite general way, I want to highlight to the reader (a) that applying the word 'farmer' might in many cases not be appropriate, because farming might not be the only or main source of livelihood for many and (b) that the communities I worked with are not homogenous. I use interview statements from individuals to support my argument, which is based on one year of fieldwork. However, I cannot claim for sure, that my perception is supported by the majority of the people concerned. The study is expected to give an overview over different aspects in a rather large area. A goal thereby is to potentially uncover blind spots through a general assessment, as e.g. suggested by Carpenter et al. (2009). More in-depth studies from different perspectives could be done in future.

When analysing the data, it however became clear that some of the collected information was not precise enough. For example if somebody stated that somebody was affected by lack of labour, it would have been interesting, to know where this lack came from; e.g. from household members working in town, people being sick, high labour requirement because the farmer had no oxen plough. Furthermore, high spatial variability sometimes made it difficult to interpret data: For the same village, one person told me that there had been droughts every year (JL_K_45M), while the other one stated (MO_K_30M) that there had been floods. These contradictory statements can be explained by the location of the fields. If the field is close to the River Nyando, it depends on rainfall in the mountain areas which control the water flow in the river, while other fields (just a few hundred meters away) depend on the local rainfall. However, the variability of answers served to get a comprehensive overview of issues affecting the socio-ecological dynamics in the area.

B. Case study: Lower River Nyando Basin

5 Selection and description of the study site and major actors

This chapter explains the selection of the study region. At the same time it describes some of the main socio-economic and ecological characteristics which are subject to change[43]. As a starting point for the empirical part the River Nyando Basin was selected as it is one of the major rivers draining the Kenyan part of the Lake Victoria Basin (See Figure 1). In addition, population densities are high in the area and have been greatly increasing during the last 50 years, which put pressure on the natural resource base. While population density was below 100 person/km² in the 1960s (UNEP 2009) the average density in the Nyando Basin is 214 person/km² nowadays (Swallow 2004: 23). In the area a number of important ecological changes have taken place along with socio-economic and cultural changes (see Chapter 6.5). Hence, the basin provides a good basis to study SNR.

Figure 1 Lake Victoria Basin (UNEP 2009: 71)

5.1 *Description and selection of the study area and the study sites*

There is no absolute rule on how to define the borders of the socio-ecological entity under observation. However, the ascription of borders has importance, as it will influence the evaluation of a setting, e.g. as it defines what is seen as external and therefore difficult or even impossible to control. Therefore it is elaborated here, how the area under study was narrowed down.

The Nyando River catchment was taken as the rough ecological starting point. Using water flows for the establishment of ecological boundaries is itself not uncontested, as boundaries could as well be drawn along e.g. altitudinal criteria, temperatures or the geological under-

[43] Aspects of landscape aesthetics were not considered, as they did not play a role in local discussions and therefore have not been assessed in the field (see e.g. Antrop 2003 or Weinstoerffer/Girardin 2000).

ground. However, a hydrological choice of boundaries seemed to be justified, as floods were seen as a major problem in the area.

Administratively, Kenya is divided into provinces, districts, locations and sub-locations. Nyando River Basin itself, as can be seen in Figure 2, is situated within different administrational units which could be chosen as boundaries from a social point of view. The overlay of the Nyando Basin with the Nyando District was chosen to narrow down the study area. While some of the following descriptions (especially the ecological one) consider the whole Nyando River Basin, the empirical study took place in that part of the basin which lies in Nyando district (dark green colour in Figure 2).

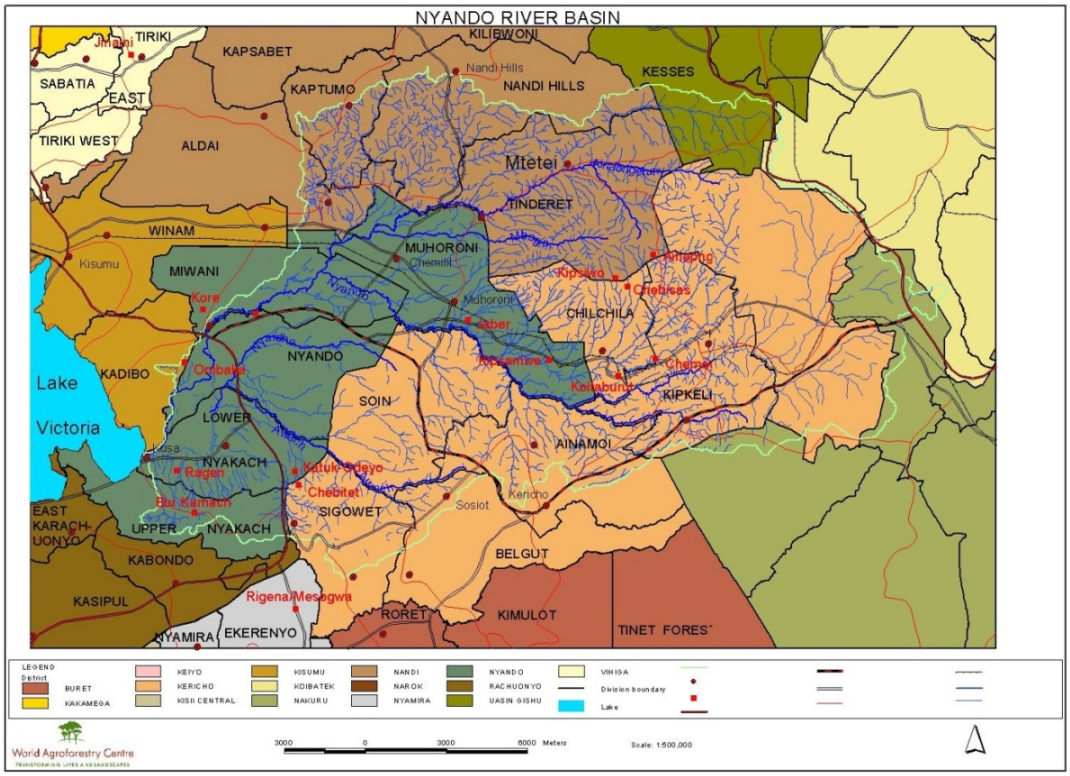

Figure 2 Nyando River Basin District and Watershed Boundaries (Onyango 2004: 42)

To be aware of the different administrative management units is of importance: Jensen (2009) argues that the upper part of the basin has low priority to cooperate with the lowlands and manage their land in a way that is as well benefitting the lowlands. The lowlands are dependent on the willingness of the highlands, e.g. for receiving clean water from the river or to reduce surface run-off from above. This was seen as a problem for sustainable resource management by the manager of COSOFAP (Consortium for Scaling-up Options for Increased Farm Production in Western Kenya) as well. He complained that administrative units were crosscutting different watersheds, which made it difficult to manage the whole watershed holistically. Apart from administrative units, land tenure distinction (settle-

ment, customary) and ethnic distinction are seen as important for the management of the watershed (Swallow/Mungai 2004: 5).

Four study sites were chosen. Three of the sites are in the LNB and one (Nyakach/Jimo East) is at a slightly higher terrain, which is not affected by floods. Geographically the LNB can be defined as the basin area between 1100m (the lake shore) and 1200 m above sea level. The Nyando River basin covers 3517 km², Nyando District 1168 km², while the LNB covers around 500 km². Instead of talking of the LNB, people used to refer to great parts of it as the Kano Plains; the flat area along the lake shore once inhabited by the Kano Clan of the ethnic group of the Luo. In the wake of changing land occupation this label however is no longer suitable, so that the reference 'the Lower Nyando River Basin' has been adopted. This label again does not always fit, as parts of the flat plain, which have formerly been referred to as the Kano Plains, in fact do not belong to the Nyando River Basin.

The decision to focus on the LNB in Nyando District is a result of a consideration of administrative, ecological and cultural boundaries. With administration and culture remaining largely the same over the area, variations in agro-ecological characteristics were selected in order to better understand how environmental variation influences the situation.

The four study sites differ with regard to the forms of agriculture, as well as the role of water availability, floods and droughts. The four selected areas are: Nyakach, Awach, Kakola and Nakuru Village (not Nakura Town which is in the Rift Valley) (see Figure 3).

In **Nyakach- Jimo East (JE)** people depend on small-scale rain fed farming. The area is relatively dry; erosion and low soil fertility are posing problems to the environment. In the **Awach/Achego (ACH)** area irrigated rice farming supported by the provincial irrigation unit is an important source of income but substantial small-scale rain fed farming also takes place; flooding can pose a problem to the population. In **Kakola-Ombaka (KAO)** people mainly depend on small-scale farming, horticulture and sugar cane production. Floods are common and during the rainy seasons the area is sometimes inaccessible. **Nakuru Village (NAK)** is a settlement within the Ahero National Rice Irrigation scheme. It can also be seriously affected by floods. Table 1 provides an overview of the selected areas.

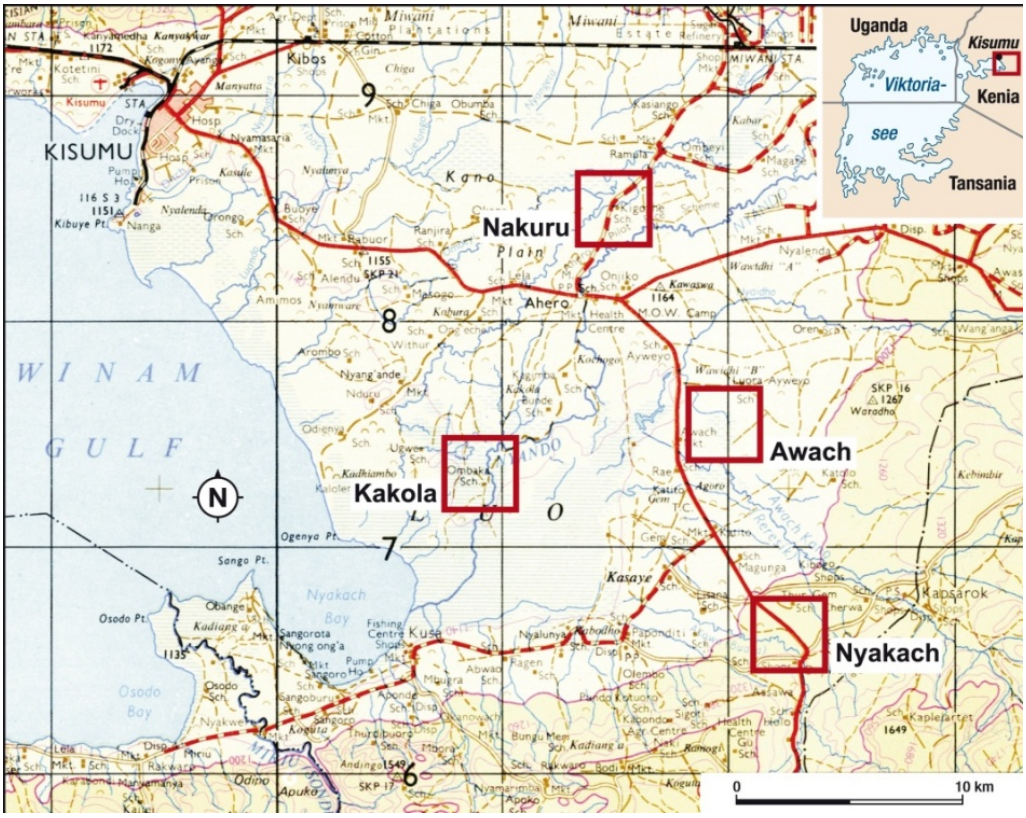

Figure 3: Study sites (Cartography: M. Wegener)

Site	Droughts	Floods	Livelihood
Nyakach/Jimo East	yes	no	Small-scale rain fed
Awach/Achego	yes/mild	yes/mild	Small-scale rice irrigation and rain fed
Kakola-Ombaka	yes	yes	Small-scale farming. Horticulture and sugarcane for income
Nakuru	no	yes	Rice irrigation

Table 1 Characteristics of the study sites

As agriculture is the dominant activity in the Lower River Nyando Basin (see Table 2) and as agriculture and cutting of trees are the main reasons for changes in the environment, the focus of the study is on households being involved in agricultural activities (no big agri-cultural enterprises where active in the study area).

Household income comprised of	
Agriculture	52 %
Rural self-employment	10 %
Wage	15%
Urban self-employment	23%

Table 2 Data on Nyando District (based on: DDP 2002 & DDP 2008)

Population density in Nyando District is 285 person/km² (DDP 2008) and thereby higher than on the average in the Nyando Basin (see above). Population growth rate is estimated to be around 3.4%, with the average household size being 4.4 household members (DDP 2008). Land in the study area formerly belonged to native reservations that were consolidated after independence, adjudicated and registered as freehold. Average farm size in the whole of Nyando District is said to be 2 ha/household (DDP 2008: 8). According to Verchot et al. (2008: 14) average farm size in the Lower Nyando area is 2.4 ha/household; however 36% of the households have less than 1.2 ha. Land scarcity is not yet seen as a big problem by many community members: "We have land; we can produce what we want" (FWO_AW40_M), an assessment which is supported by Omutsani (2004: 15f) who states that land is not yet a limiting factor in the Nyando Basin. Nevertheless, some households complain either about absolute land scarcity or limited fertile land.

Whether and in which way the area is poor, is constantly discussed[44]. In 2006 there was a countrywide discussion with many districts arguing to be the poorest, not least because it is expected that the poorest district might get the highest support from international aid organisations and national equalisation funds. The average poverty rate in Nyando District is 60.5% varying between 50 and 70% in the district (DDP 2008) and with that it is often referred to as (one of) the poorest districts of Kenya.

However, locally the area is often presented as being rich (DEO_NG_40M), having potential (MGU_NCA_40M) and not being poor "in terms of resources" (MF_NCR_40M). The Lake Basin Development Authority (LBDA 2004) talks about the area as having a nature and culture between abundance and deficiency. Similarly:

> "Land resources in the Lake Victoria basin present the inhabitants and their development partners with monumental paradoxes including enormous natural resource wealth with potentially high endowment value yet majority of the people live in abject poverty and being home to incredible land-use diversity yet the ecosystems are fragile and easily degraded by unsustainable land use." Ochola, W.O. (2006) in Odada et al. (2009a)

With regard to poverty trends, some voices in the community can be heard which state that the living standard increased, while others say that poverty increased. Those who talk about an increase in the living standards often refer to 'modern aspects' of life such as improved housing, communication, access to health care, power and transportation (MN_J_30F, DA_N_30M). However, while the spread of the mobile technology did increase connectivity and accessibility of great parts of the population and most of the houses have iron roofs these days, which are more rain proof, people are frequently confronted with the

[44] E.g. "Geographic Dimension of Well-Being in Kenya, Who and Where are the Poor?" (GoK 2003b)

problems of access to basic needs such as food, seeds for farming and money for school fees.

The age structure of the population has been severely influenced by the HIV/AIDS pandemic. A total of 70% of the population is below the age of 30, whereas 44% of the population is below the age of fourteen. However, when visiting the area in 2010 for a few days, the people I talked to (NGO workers, middle class town people, rural population, scientists; altogether around ten people) had the feeling that awareness rising had been successful and a high percentage of the affected population was already on the use of ARV (antiretrovirals) to suppress the HIV virus; thereby stopping the progression of the disease. I met a number of people myself who successfully used the ARVs and were trying to convince others to go for treatment as well. Nevertheless, death of household members that can be attributed to HIV/AIDS was still prevalent. The District Development Plan (DDP) in 2002 stated the HIV/AIDS prevalence was 30% however the number reduced to 15% in the following DDP (2008).

The population living in the study area belongs to the ethnic group of the Luo. When talking to people, frequent reference was made to the Luo tradition as is discussed in more details in Chapter 6.4. Awareness of cultural boundaries is important as well, in order to understand the developments in the region. Some important independence fighters were Luo; Tom Mboya, was one of the most prominent figures during that time. That is why the Luo expected to get government positions after independence. Between the late 1960s to the 90s, however, the Luo lost more and more of their influence in the government. Especially during the time of the 2nd president Moi[45] (from 1978-2002) the area is described (by the local population) as having increasingly been neglected as the Luo formed a strong opposition to the government. Although no concrete figures were collected during the thesis, it was felt to be a common understanding among everybody I met, that the area around the lake had indeed suffered economically from this neglect. The politically induced clashes between the Kalenjin and the Luo, which materialised around Muhoroni sugar factory (in the border area) in the 90s, are one of the violent memories of those times. Even though, especially in the cities, the Kenyan population is quite mixed, ethnic affiliations are of importance and politicisation of ethnicity still exists, as could be seen in the post-election violence of 2008 (for more subtle impacts of the violence see Chapter 6.2.4).

As I want to talk about socio-ecological dynamics; in the following two chapters (5.2 and 5.3) the focus is first on nature and then on society. However, in order to describe the dynamics in the natural setting, the social has to be included and vice versa. In Chapter 5.2 nature serves as the ordering variable, whereas in Chapter 5.3 the main actors influencing

[45] A Kalenjin (ethnic group)

environmental management will serve as the ordering variable. The changing focus helps to assure that a variety of aspects influencing the dynamics is captured. Thorough knowledge about environmental aspects furthermore allows reflecting on the representations given about the environment by the local population and seemingly self-evident environmental facts can be questioned by understanding different views within a society. Knowledge about the social setting is important to discuss available environmental management options. Chapter 5.2 presents hydrological issues in the catchment, the main soils and the on-going land use changes and accompanying problems.

5.2 *Ecological setting and changes*

Main climate drivers on a large scale in East Africa are easterly monsoons and the passing of the inter-tropical convergence zone (Anyah/Semazzi 2007). The annual average maximum temperatures range from 29 - 31°C, with the minimum ranging between 12-16°C. Rainfall pattern is bimodal with the rainy seasons being around March/April-May/June (long rains) and October- December (short rains). While the highlands receive rainfall of 1800 to 2000 mm a year, the lowlands only receive 800 to 1200 mm (WRI et al. 2007: 15)[46]. While climate change is predicted to change rainfall amounts and patterns in the long run, according to Koutsouris et al. (2010), local and regional hydrological discharge trends are so far mainly driven by local and regional water and land use changes and not yet by large-scale climate changes. Obtaining reliable rainfall data for the area is difficult, since they are often not available locally and according to Koutsouris et al. (2010) large spatial variability makes extrapolating from regionally observed hydro-climatic trends difficult. Apart from the overall amount, temporal variability is the dominant characteristic of rainfall in the basin, with unreliable rainfall patterns as one of the main factors affecting agricultural production and food security (Omutsani 2004: 15). Severe droughts occur approximately every 5-8 years during the long rainy season (Koutsouris et al. 2010: 3). What the LNB however is known for are its floods, which are said to have been increasing in frequency since the 1960s/70s (e.g. Swallow/Mungai 2004: 4). An area of around 400 km² (JICA/MoPD 2005) is in risk of flooding (Figure 4). Therefore problems of rainfall and flooding are dealt with in detail in Chapter 6 and 7.

[46] or up to 1600 mm according to Mbaria (2006: 7)

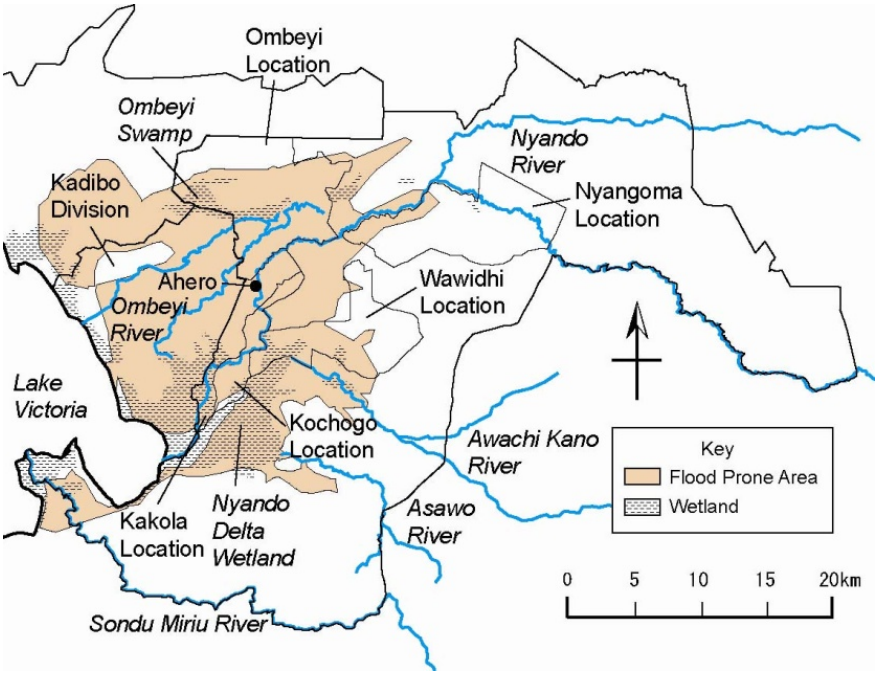

Figure 4 Flood prone areas (JICA/MoPD 2005)

Apart from rainfall, the lake level has a significant hydrological impact on livelihoods. The lake level influences the success of small-scale fishermen, the water availability for the households, as well as the housing and agriculture potential around the lake (as is shown later in the section about wetlands). Furthermore, it influences the characteristics of floods in the lowlands and the erosion potential of the river.

Figure 5 and Figure 6 show the high variability of the lake level over the past 100 years. These two figures furthermore illustrate that evaluating and describing changes in floods and water levels depend on the chosen perspective. With the baseline being put at the lake level of 1993, Figure 5 gives the impression of a decline of the level, with just unusually high levels around 1998. This is a picture, which is as well present in discussions at the local level, where it is feared that the declining lake level will have an impact on the lake as source for water, food and energy. Dams draining the Lake Victoria in Uganda are most often blamed for this drop of the lake level. Figure 6 shows the fluctuation over a longer period of time (around 100 years). It shows that water levels in Lake Victoria were unusually high since the heavy rains of the mid-1960s and that in fact water levels have just returned to the levels of the first half of the 20th century in 2010. From that point of view the falling level can still be interpreted as a threat, but it would be more difficult to argue that a completely new or 'unnatural' situation would be developing. The discussions around the 'natural' lake level can further be seen as an example of the issue of the subjectivity of ascription of naturalness or pristineness (see Chapter 2.1).

Figure 5 Water level of Lake Victoria relative to the 10-year average (Minakawa et al. 2008:2)

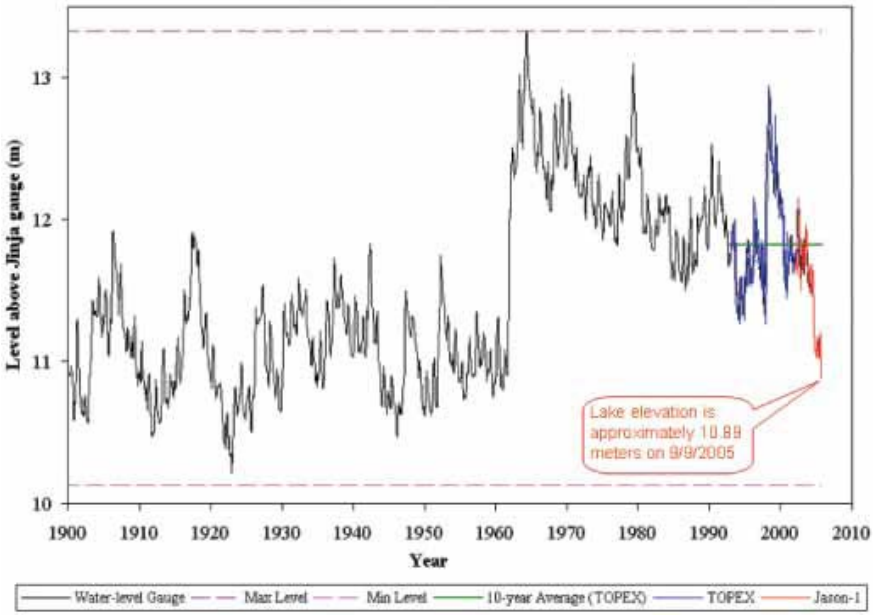

Figure 6 Water fluctuations between 1900 and 2005 (wwwCPC)

Soils in the Basin have been divided into three different main groups by Bengtsson (2001): Soils on plains, soils on foot slopes and soils on middle slopes. Soils on the middle slopes are dark red to brown. They can be classified as Regosols (FAO classification) which consist of non-alluvial unconsolidated materials with an A horizon with low organic carbon as the only diagnostic horizon or as Lithosols (shallow soils that have solid rock within 25 cm of the surface (see as well Jaetzold/Schmidt (1982) in Bengtsson 2001). Soils on foot slopes are of a dark reddish brown to dark yellowish brown soil with varying texture. Many of them show a top soil (A) horizon with low organic carbon (Arensolos according to the FAO classification), or show an argillic subsurface horizon, which is characterised by illu-

vial[47] accumulation of clay. Soils on plains are deep, very dark to black soils; often referred to as black cotton soil. According to Bengtsson (2001), they consist of cracking clay loam to clay with calcareous deeper subsoil. Soils in the plains have high to moderate fertility but are subject to water logging due to the high clay content which leads to slow percolation. Therefore rainfall pattern is of special importance to the plains.

> "In this our area, the type of soil we are having is not good, because, when the rain is raining you can't plough because it has a low drainage system. Hence there comes a lot of water for a long time. It is also the same when the sun is shining. The land is so dry that even a jembe [hoe] can't plough it properly. So we are planting with the duration of how the season is varying. It is not a specific time when we plant." GD_NAK

With regard to the whole Nyando basin, soil erosion and land degradation are viewed by ICRAF as the most severe environmental problems; especially in the upper and middle part of the basin. Average net erosion rates reach around 43 tonnes per hectare per year (Onyango et al. 2003: 6). First signs of declining soil fertility have already been reported in 1945 (Butterman 1979: 177) especially in the upper part of the basin. Locally, however, the soil is still regarded as being highly productive in many lowland areas (FTO_J_65M).

Erosion is mainly caused by land use changes which are related to deforestation and agricultural expansion (Odada et al. 2009b). Walsh et al. (2004: 28) could show that over the last 150 years a shift of vegetation dominated by trees to mainly grassy vegetation or agricultural land took place. Reduction of riverine vegetation, extension of agriculture up to the riverbanks and the establishment of homesteads closer to the river, can be seen on aerial photographs and satellite images from 1948, 1963, 1967, 1979 and 2000 (Swallow/Mungai 2004: 3f). Change in land use cover is still going on: Between 1991 and 2006 the total land under agricultural food crops changed from 14.28% to 16.56% in Nyando, the area under tree crops increased from 2.67% to 4.64%, while the percentage of land under natural vegetation reduced from 64.82% to 55.87% (the rest of the land was covered with sugar cane, roads and infrastructure, while for around 10% no data existed) (Swallow et al. 2009). While areas under tea or sugar only show slow and minor erosion (Ong/Orego 2002), bare soil, as found for example on maize fields is prone to fast and extensive erosion. Apart from vegetation cover, rainfall characteristics heavily influence erosion potential. Erosion shows worsening during heavy rains (Walsh et al. 2004: 27).

As a result of the erosion huge gullies develop in the landscape and there are areas in which erosion seems to be beyond control.

> "Today, as much as a 1.5 m layer of soil, worth millions of dollars, has been washed away." Mbaria (2006: 7)

[47] Deposited material removed by percolating water from upper soil profile.

The unconsolidated material in the middle slopes is especially vulnerable to erosion, as can be seen in the famous Katuk Odeyo Gulley (Figure 7 and 8). It is a gulley that reaches several kilometres down from the slopes up to the plain area where it enters a river.

Figure 7 Katuk Odeyo gulley (Google Earth 2012)

Figure 8 Gulley erosion in Lake Victoria Basin, Nyando District (Picture: ICRAF)

The gulley has a severe impact on people's lives: livestock is washed away, houses are swallowed and graves are uncovered (see Figures 9 and 10).

Figure 9 Tree fallen into Katuk Odeyo gulley (Picture: own, November 2010)

Figure 10 Exposed water pipe as a result of massive erosion around Katuk Odeyo (Picture: VI Agroforestry)

Apart from causing problems on-site, the erosion poses problems off-site. River Nyando is carrying a high sediment load leading to sedimentation of the water channels downstream. Sedimentation rates have increased 3-4 times over the last 100 years (Walsh et al. 2004: 27). The sediments are blocking distribution channels for rice irrigation, as well as drainage channels and waterways. Ong/Orengo (2002) state that the costs of desiltation are too high to make irrigation a profitable business. For example about 200 m^3 of sediment have to be removed from the Gem-Rae irrigation scheme (in the LNB) every week (Ong/Orego 2002). As a consequence of the blocking of the drainage channels and sedimentation in the River Nyando itself, floods in the plains are becoming more severe (Onyango 2004: 44).

Furthermore, as a consequence of erosion, agribusiness along the river and intensive use of pesticides in the upper part of the basin, polluted water reaches the lake. This is aggravated by the conversion of 6500 ha of wetlands (out of 8500 ha in total) into irrigation schemes (see Chapter 6.1) or small-holder agricultural fields, which reduces its important buffer and water purification function (Swallow 2004: 26). The population therefore struggles with a reduction of fish found in the river and the lake (Swallow/Munga 2004: 4) as well as the decreasing quality of the water for drinking and other household purposes.

Apart from filtrating and cleaning the water entering the lake, the wetlands close to the lake further serve multiple important purposes: They are a source of papyrus and reeds; a grazing refuge during the dry period; and a breeding area for wildlife. Efforts are on-going to prevent depletion. However, it is difficult to keep communities from opening up new fields in order to grow maize, tomatoes and other horticultural products. They see it as their right to use the wetlands and state that they depend on them for survival, thereby mainly referring to the production potential of the wetlands. In contrast, government and NGOs are trying to prevent people from, what they regard to be 'destruction of the wetlands', thereby referring to the regulating services[48] (filtering of water, breading place, etc.) of the wetlands. But, not only small-scale farmers go for the fast money that the transformation of wetlands into fields for horticultural production provides, also highly powerful people, e.g. a manager of an organisation working on wetland protection, are connected with wetland destruction through wider family ties (as the manager told me himself). Given that, communities, even though having received trainings on wetland protection, do not necessarily take it seriously, as the promoters of protectionism are themselves seen as being responsible for the destruction of wetland; "he [a workshop convener on wetland protection] is not straight forward himself" (farmer along the lake shore).

[48] The ecosystem services approach distinguishes between supporting, provisioning, regulating and cultural services of ecosystems (Millennium Ecosystem Assessment 2005).

5.3 *Actors – perceptions and approaches*

This chapter introduces the multitude of actors working in the field of environmental management and agricultural production in the basin. In doing so. I want to follow Görg (1998 and 2003) (see Chapter 2.3) who emphasises the importance of an understanding of the social actors involved in regulation. First international and national frame conditions and policies are introduced, before focusing on local level development projects, NGO activities and community groups.

5.3.1 International and national frame conditions

As the Nyando Basin is draining into Lake Victoria it is subject to regional agreements on the management of the Lake Victoria Basin (Nile treaty, see e.g. Okoth-Owiro (2004)), which impact on developments in the Nyando River Basin on a large scale. The Lake Victoria Basin Commission (LVBC) "is a specialized institution of the East African Community that is responsible for coordinating the sustainable development agenda of the Lake Victoria Basin"[49]. On the Kenyan part the LBDA, is supposed to coordinate activities.

On a national level the National Development Plan (NDP) (2002) gives an overview on governmental strategies towards development. The title and overall object of the NDP is "Effective Management for Sustainable Economic Growth and Poverty Reduction" (NDP 2002). Furthermore, in July 2008 the Government of Kenya (GoK) launched its Vision 2030, which addresses the existing economic challenges. The transformation of agriculture plays a key role in this vision; the focus is on utilising idle land and irrigating an additional 1.2 million hectares (Otieno 2008).

Apart from the NDP, since the 1990s, Poverty Reduction Strategy Papers (PRSPs) (Gok 2003a) are important policy papers for development cooperation. The PRSPs orient themselves towards the Millennium Development Goals (MDGs), which are an international effort to rationalize and straight-line development aid.[50] While Kenya is likely to meet Goal 2 ("Achieve Universal Primary Education") and Goal 6 ("Combat HIV/AIDS, Malaria and Other Diseases") of the MDGs (GoK 2005) the eradication of extreme poverty (Goal 1) and ensuring environmental sustainability (Goal 7) are less easy to achieve. For Goal 1 and 7 JICA/MoPD (2005) states the following (Table 3):

[49] http://www.lvbcom.org/ (last accessed August 2013)

[50] http://www.un.org/millenniumgoals/ (last accessed August 2013)

Goal	Current Status in Nyando
Goal 1: Eradicate extreme poverty	All 11 communities see poverty as having been worsened. Especially the situation of orphans and vulnerable children was mentioned.
Goal 7: Ensure environmental sustainability	In Nyando District a great number of tree nurseries could be observed and community was actively engaged in tree planting. Therefore, JICA/MoPD assume that the target 1 ("Integrate the principles of sustainable development into country policies and reverse the loss of environmental resources.") could be achieved. However target 2 (access to safe drinking water) is far from being achieved.

Table 3 Millennium Development Goals, status report for Kenya (JICA/MoPD 2005)

According to Nasong'o/Gabsa (2000) until 1974 no explicit mentioning of the need for environmental protection can be found in the Kenyan development plans. Out of an ad hoc Working Committee on Human Environment later on the National Council for Science and Technology was formed and then reconstituted as the National Environment Secretariat "to serve as a scientific watchdog of the environment" (ibid.: 78). During the 1980s, the time of the structural adjustment programmes, it was mainly tried to achieve environmental protection through controlling human behaviour (ibid.: 78). Activities included environmental monitoring and assessment and the promotion of the slogan 'if you cut one tree, plant three'[51]. The National Environmental Management Authority (NEMA) was established in 1999 as the legal authority to supervise and coordinate all environmental matters, and the implementation of governmental policies (Buigutt 2004: 16). Besides NEMA, the Minister of Agriculture can make rules, e.g. for afforestation and reforestation, protection of slopes, land drainage, maintenance of critical drains and terraces (Nasong'o/Gabsa 2000: 82).

On a district level those policy papers and institutions have impact or local equivalents as well. Nyando District forms part of the Nyanza Province. It is a relatively new district, which was formed from part of the Kisumu District in 1998. The District Development Plan (DDP) is the local level planning document. Different ministries under the coordination of the District Commissioner (DC) prepare the DDP for a period of seven years. Therefore, its time frame is medium and short-term development. The development plan mainly discussed here is the one for the period 2002-2008 (DDP 2002). The DDP shares the overall objective with the NDP, and also refers to the District Poverty Reduction Strategy Paper (District PRSP).[52] The DDP, the National PRSP and the National Development Plan (NDP) are linked through the Medium Term Expenditure Framework (MTEF) and annual budget expenditures (DDP 2002: 19). The DDP translates the policy objectives into activities. NEMA

[51] In Kisuaheli: Kata mti moja, panda miti tatu.

[52] Equally the Lake Basin Development plan works within the policy framework of the NDP 2003-2008 and refers to the overall theme of the Kenyan government (LBDA 2004: 30).

is represented on the ground through District Environment Committees (DECs). The DECs have the task to enhance the implementation of the Environmental Management and Coordination Act (1999) in order to achieve proper and coordinated management of the environment (Buigutt 2004). The DECs consists of district staff, farmers' representatives, NGO representatives and representatives of community-based organisations (ibid.: 19f). I never heard of DECs while being on the ground or talking to people, so it is hard to judge how effective they are. The District Development Committee (DDC) is supposed to look at development issues, start new initiatives and coordinate the on-going ones. The DDC meets quarterly with representatives from government departments, parastatals, local elected leaders and NGOs (Kisumu DDP 1994: 28).

On the level of the development of policies, strategy papers and even structures set in place, it looks like enough has been done to take care of the improvement of environment as well as human welfare. The question however is, whether all those papers are implemented and whether the institutions work.

One example of a gap between paper and reality can be seen with regard to the implementation of the strategies identified in the PRSPs (GoK 2003a). While the civil society was involved in the process of writing the PRSP, it was not engaged in budget allocation later on, so that actually the allocation ended up not being in line with the problem priorities. Swallow finds:

> "All in all, the issues of agriculture, rural development and human resource development that were given 87.8% of the priority score by farm communities in Western Kenya would be allocated only 19.6% of all PRSP resources." Swallow (2005:13)

Similarly Nasong'o/Gabsa (2000:104) conclude that environmental concern has largely remained at the political rhetoric level with no subsequent sufficient budget allocation. Given this situation, it is unsurprising that the DDP (2002) states:

> "By the end of the 1997-2001 Plan period the situation remained generally as it was at the beginning of the Plan period." DDP (2002: 16)

Funding is often mentioned as a reason for malfunctioning organisations or poor or even absent implementation. While the DDC is said to have worked well whilst funded through the Rural Development Funds, this money goes to the constituencies since 2003[53] through the Constituency Development Fund (CDF) (DN_PAO_45M). An analysis of budget allocations can give different insights to priorities or reasoning of the involved actors than strategy papers and reports. I will concentrate on the Constituency Development Fund (CDF) here, as it should be closest related to community priorities.

[53] Politically, Kenya is divided into 210 constituencies.

The constituency development fund (CDF) is allocated 2.5% of the collected revenue (= 16 million US $). Each constituency is to get the same amount of money; however based on different poverty levels some additional allocation to poor constituencies is possible. On a national level most of the CDF money is used for infrastructure development in the sectors education, health, water, roads and electricity (GoK 2005). An analysis of the CDF use within Nyando Constituency from 2003-2010 (Table 4) shows that the focus of use has been on the construction of school buildings, which might show that this is the priority of the population[54]. It could furthermore be related to the introduction of free primary education for all in 2003. However, it could also be that interventions in the education sector are simply more expensive than in other sectors where it might be possible to achieve a lot even with a small amount of money. The small amount given to agriculture might also be attributed to the fact that the CDF does not allow for funding of individual groups since CDF projects have to have a wider community benefit (JICA/MoPD 2005). Consequently, in the area of agriculture, the projects that can be funded are mainly larger scale rice irrigation schemes.

Sector	No. of Projects	Funding [millionKsh]
Health	10	39
Primary School	85	74
Secondary School	29	73
Agriculture	7	10
Water	12	14
Roads	8	7
Administration	22	29
Emergency reserve	1	13

Table 4 Spending of CDF in Nyando Constituency (based on: wwwGoK-1)

In brief, while agricultural development is often presented as the priority for development, it seems like the funding is not allocated accordingly. This gap might be partly filled by activities of development projects and NGOs that are working with individual farmers or small community based groups.

5.3.2 Major development projects and NGOs in Nyando District

Development projects play a visible role in Nyando District and the DDP lists numerous ongoing projects in different sectors (Table 5)[55].

[54] It would be interesting to study who actually takes the funding decision on the ground.

[55] Sectors are grouped according to the NDP

Sector	No. of Projects	Costs [millionKsh]
Agriculture and rural development	45	1690
Physical infrastructure	32	1081 (all spent on roads)
Human resource development	21	225 of which 100 to physical school facilities
Trade, industry and tourism	4	20.5
Information Communication Technology	1	0.4
Public Administration, safety, law and order	5	38

Table 5 Development projects grouped by sector (based on: DDP 2002).

While Table 5 gives the impression that a lot of money is spent on agriculture and rural development, Table 6 shows, that a substantive amount of the money (1337 million KSH) is actually spent on the construction of dykes, which can as well pose a problem to agriculture, as is discussed below (Chapter 7.2.2 and 7.4). In fact, water management (including dykes) gets more than 90% of all funds for agriculture and rural development. Table 6 further shows, that most of the money is spent on infrastructure, be it dykes, offices, storage facilities or cattle dips. Other agricultural activities only get around 2% of the funds. The focus here is on training.

Agriculture and rural development	[millionKSH]	Number of Projects
Flood control (dykes)	1337	2
Office Construction	2.4	1
Water Management		
Water supply	214	7
Micro-Water catchment	6	1
Agriculture		
Training on community based rice production	0.6	3
Training on fruit production, horticulture, tree nursery, agroforestry	3.9	4
Reintroduction of cotton seeds	4	1
Introduction of cassava	2	1
Training on safe use of pesticides	0.7	1
Training on agriculture and livestock (combined in one project)	20.5	1
Environmental Protection		
Tree planting	1.6	2
Livestock		
Provision of dairy goats and cows	11	4
Disease control (cattle dips, tsetse traps)	15.5	4
Diseases control through vaccination	1.5	1

Increased production through artificial insemination (training)	1	2.6
Beekeeping	1	1
Fish		
Fish storage facilities	88.5	4
Loans to fisherman	20	1
Fish production	9	3
Training of fishermen on environmental awareness	3	1
Sanitation at the beach	1	1

Table 6: Projects in agriculture and rural development planned for the period 2002-2008 (based on: DDP 2002)

In order to see whether the project activities overlap with community priorities, they can be compared with the activities of common interest groups (CIGs)[56] that had been formed and trained by the National Agriculture and Livestock Extension Project (NALEP). The activities of the CIGs are shown in Table 7.

CIG Activity	**No of CIGS**
Trees and Crops (nurseries, fruit trees, farm forestry, agroforestry)	42
Crop diversification (bananas, cassava, horticulture, rice, cereal)	48
Water management	16
Soil fertility enhancement	20
Livestock improvement livestock	24
Energy-saving stoves	12

Table 7 Community interest group activities (Mbaria 2006: 37f)

The priorities of activities conducted by the groups differ from the activities of projects and organisations presented. One interpretation would be that the large-scale projects do not really get to the local level problems, on the other hand it can be stated that infrastructure development on a large scale (roads, schools, cattle dips) is necessary as well. From that point of view it might even be argued that the projects and activities provide a complementary mix of interventions. What is the role of NGOs within this setting?

There are around 22 NGOs working in Nyando district (own observation and consultation with District Officers and the NGO forum). In the table below, the most important NGOs working in the agricultural sector in the study area are listed (Table 8)[57].

[56] However, it needs to be kept in mind that the CIGs might be influenced by the external actors supporting the groups.

[57] Apart from the listed NGOs, Osienala focusing on fishing communities; Sustainable AID in Africa International is focusing on water and sanitation; the Small Holder Project Irrigation Support Organisation and Ombeyi Multipurpose Farmers' Cooperative Society are focusing on rice production and marketing; Alungo Farmers' Cooperative Society's focus is on sugar-cane marketing; Omega Foundation, Inter Diocesan

Name, aims and area of activities of NGOs
VI Agro - agroforestry knowledge, tree establishment, soil fertility improvement through agroforestry, soil conservation and rehabilitation (gully control, protection of river banks, use of enclosures) Income generation activities: fish farming, horticulture, dairy cows/goat keeping, bee-keeping, poultry, marketing of agricultural crops, resource mobilization, fundraising. Trainings on strategic planning, visioning & collective action.
CARE Kenya – health, water and sanitation, agricultural extension services, promotion of commercially oriented agriculture including rice cultivation (access to improved varieties of seeds – basmati, through a revolving fund system), mango and vegetable farming, food security (cassava, early maturity maize varieties). Capacity building and trainings on leadership skills.
World Vision - child management, sponsoring orphans and vulnerable children, health, home based care, HIV/AIDS awareness, assistance to schools: building materials and desks; water and sanitation: boreholes, training of pump attendants/ committee; food security and livestock
Victoria Institute for Research on Environment and Development[58] **(VIRED)** wetland conservation; water resources management: flood control through food for work; agriculture and bee-keeping
Community Rehabilitation and Environment Protection Programme[59] **(CREPP) -** emergency response, short term relief items; food security, dry land farming (shallow well construction); dairy goat introduction; environment, agroforestry; water and sanitation; micro-enterprise development, small credit; HIV/AIDS; training and capacity building; advocacy

Table 8 NGOs and their activities in the study area (own compilation)

VI Agroforestry and CARE Kenya are the biggest NGOs working on agriculture in the area. VI Agroforestry is an International NGO, which was established in Kisumu in 2002. It is funded by SIDA. The goal is to work with farmer organizations, in order to support them to become independent. There is a focus on gender equality and on poverty alleviation or improved livelihoods. The target groups are small-scale farmers (0.8 - 2 ha).

Starting in July 2004 CARE Kenya had embarked on a five-year project in Nyando District under the framework of its component of '**T**he Improved **A**griculture for **S**mallholders in Western **K**enya' (TASK). This component was meant to make farmers appreciate farming as an economic activity. In Nyando District 1115 households had been trained in selling agricultural produce by the end of the project and according to the final project documentation (CARE International 2010) the formed farmer associations have developed capacity in

Christian Community Services, Pamoja and the Christian Children Fund are dealing with Orphans and Livelihoods; Local Initiatives Development Agency is carrying out a Youth Behaviour Change project and finally there is Solar Cookers International.

[58] http://vired.drupalgardens.com/content/home (last accessed Dec 11th, 2011)

[59] http://crepprograme.org/AboutUs.htm (last accessed Dec 11th, 2011)

accessing markets for their products. CARE was further focusing on revival of rice production, introduction of horticultural crops through contract farming and improving production of tree products (TC_NCA_35M). They also funded a Food for Work (FFW) project for flood control implemented by VIRED, which has been used to open clear drainage channels and thereby reduce the impact of floods (see Chapter 7.3). World Vision is the third international NGO. Even though their focus is on children, they also have a number of agriculture based projects.

CREPP and VIRED are local NGOs, they however rely on international funding. In 2005 and 2006 VIRED was involved in the FFW project funded by CARE, while at the same time doing research, basically on water quality issues. In 2010 their focus had shifted to the protection of wetlands, with one of the activities being honey production and marketing. The managers of VIRED are lecturers at a Kenyan University. CREPP was started after the clashes in Western Kenya in 1992 to deal with the clash victims and later on changed its focus to agriculture. CREPP is involved in all kinds of agricultural activities, just as CARE and VI Agroforestry. However, they stated that they are focusing on training in schools in order not to compete with VI Agroforestry.

From the listed activities and my own observations, it appears that organisational activities are often similar or overlap[60]. For example, even though the focus of VI Agroforestry is on agroforestry, many side activities found their way into the project. Not only do their activities now include bee keeping and poultry keeping, but also HIV/AIDS awareness rising (AK_VI_35M). Something similar can be said for many other organisations working in agroforestry or agriculture; and those that have their main focus on orphans or on health care, still have an agricultural component. The DDC could help to coordinate development efforts within the district; however this is hampered by suspicion and competition between organisations. As organisations want to keep the funds for themselves and are afraid of losing them, when showing what resources they have, they are not willing to reveal what they are doing. As the DDC has no legal mandate, the District Development Officer (DDO) complained, that the DDC "is just like a talk shop" (PO_DDON_40M). The coordination of activities is therefore difficult.

As arose out of conversations with fieldworkers from NGOs the introduction of other than the main activities is often the result of the field workers negotiating with the head offices, as they are confronted with the households' daily needs. Field workers have to struggle with the fact that they have to implement what they are told from the headquarters and at

[60] Two other projects that are active in the Nyando Basin and basically have the same goal are the Western Kenya Integrated Environmental Management Project (WKIEMP) and the Lake Victoria Environmental Management Project (LVEMP) that both have launched an integrated soil and water conservation campaign.

the same time would have to address the individual needs presented to them in order to make households interested in actively participating in their projects, and not only taking the offered benefits, without real commitment. Fieldworkers however have only limited capacity to listen to the voices from the field. One of them claimed that they are "just implementing what they tell us from above" and argued that decisions should be made at appropriate level and not "up in Nairobi" (NA_VI_25M).

The necessity to adjust projects to the situation on the ground was also expressed – even though from a slightly different angle – during a district level workshop (WKIEMP Nyando 31st of March 2010). There the following speech was given:

> "Learn, Learn with the farmers. Start to find simple solutions. Start thinking free; develop creativity and critique. Don't stick to school knowledge, do business in an unusual way. [...] Be consistent with the reality on the ground. Think like a farmer." (Speech at WKIEMP Workshop-Nyando, 31st of March 2010)

The first steps towards the acknowledgement of the necessity to be flexible and reflective can sometimes lead to ambiguous statements as is shown by the evaluation of a VI project that claims to have a project approach that allows a high degree of flexibility with regard to the use of the budget and the implementation of the projects.

> "Flexibility in implementation is a noteworthy strength of the Program. On the other hand, flexibility without proper control and co-ordination may also invite double efforts and unnecessary mistakes. [...]The Team recognises the importance of concentrating on the core agroforestry messages and suggests that other farmer priorities should be catered for mainly through active cooperation with other aid partners." Haldin et al. (2000: 2)

According to the findings in the field, the quotation above basically highlights a key dilemma of many organisations working in the area. They have to have their own profile, sticking to their mandate and need to respond to local needs at the same time, which often do not match their remit.

What could we learn so far about the actors and their goals? And what are the implications of this with regard to SNR in the study area? The activities of the organisations are biased by the niche they want to claim for themselves in the development and natural resource management field. In order to understand what activities the organisations are pursuing one has to start from their aims, and not necessarily from the needs on the ground. Even though aid organisations might be aware that their approach is not perfect to address the problems on the ground, they will stick to it, in order to get funds. When using the whole area as the level of analysis it needs to be realised, that sub-units of the area, such as NGOs, depend on external factors to survive (maintain its' structure and function), which influences the dynamics within the SES. Or otherwise put, the actions of the NGOs are

influenced by the existing structures, but through feedback to the funding agencies might change them with time.

5.3.3 Community groups

A current approach of most of the agencies working in Nyando in order to involve larger parts of communities is to work with local institutions and more specifically to work with local community based groups (Mbaria 2006: 44f). Working with groups is seen as allowing for better channelling of development information and other resources (Opare 2007). While in development jargon the argument is that group work would help communities to better deal with problems, from the communities' perspective, the groups basically serve to deal with external demands:

> "we all went groups because we were seeing the benefits other group members got" GD_JE

During his Baraza[61] in Kakola-Ombaka the district agriculture extension officer asked people whether there are groups he could be working with; the community responded that they need someone to teach them on agriculture and if required by the MoA they could as well form groups.

In 2006, 4032 Groups, out of which 2200 are women groups, had been registered at the District Social Development Office (DSDO). This sudden appearance of literally thousands of groups shows the capability of the local population to react to the demands articulated by donors. And it furthermore shows that farmers need to deal with environmental change as well as changing frame conditions as provided by the state and the numerous other actors active in the area.

Groups bring along benefits, especially cooperation and mutual help that are serving the wellbeing of the communities. "We even help each other when a member falls sick" (EO_J_30F). Another positive effect is, that group work encourages people to attempt to do things that an individual might have never tried or could not have handled alone. In a heavily eroded area in Nyakach, group work allowed for a reduction of erosion, as the groups (in the specific case the three groups: Kalacha, Kowala and Joseco[62]) "dared to plant trees where nobody had been daring before" (GD_JE). While in 2003-4 there still was a lot of

[61] Baraza is a Kiswahili word that in general means: meeting place, assembly or palaver. Barazas are official meetings within the community in order to spread the latest news and to discuss issues of concern.

[62] The three groups doing environmental rehabilitation are supported by three different agencies, the Kenyan Agricultural Research Institute (KARI), VI Agroforestry and ICRAF. All organisations supported the planting of trees and therefore it can be asked again, whether there could not be better coordination of the work in order to avoid duplication of efforts. However, the organisations used different methods for the rehabilitation, which at least makes it possible to compare and maybe learn from the difference experiences: KARI is using fences to allow natural regeneration, while ICRAF demands from the groups that they find ways of keeping out animals themselves, based on responsibility of the livestock keepers. Support started around 2006. At the end of 2010 the KARI and the ICRAF sites were visited. In both sites the vegetation cover in the lower lying areas had increased; trees and grass had grown

pessimism due to the experience of the on-going decline of agricultural productivity and environmental quality (Mungai et al. 2004) in 2006 and as well later in 2010 people in Nyakach were proud off their achievements (see Figure 11).

> "They have controlled erosion in most parts of the area. We are proud of them and we see Jimo East a small Kericho in a few years." GD_JE

Figure 11: Formerly bare land now covered with trees (Picture: own November 2010)

The formation of groups has some benefits, but it also brings along problems and new threats. In one group the treasurer had embezzled the groups' money, leading eventually to the group becoming dormant. The lack of attendance to meetings and activities are other sources of frustration for those who engage themselves in group work.

Furthermore, there are limits to local solutions for environmental problems. In the vicinity of the Katuk-Odeyo gulley KARI had supported a local group work in order to try to stop erosion by erecting a fence and planting trees close by, but in 2010 some parts of the fence had already been washed into the gulley and according to the people living in the region, the situation had not improved and the gulley had further advanced. Especially those communities were asking for a big dam to be built on the higher slopes in order to reduce the amount of rainwater runoff.

This rough overview of the area has already pointed to some problems of resource management in the region. Among others it has shown the multitude of actors, organisations and strategy papers in place that deal with resource management and rural development. That in mind, the following chapter looks in more detail at agriculture, as it is here where society and nature most prominently meet.

6 Agriculture in the Lower River Nyando Basin

"The sun found me when the plants were not yet flowering." GO_JE_30M

"Kujaribu bahati [Trial and Error]. You try. Sometimes if you don't get, you find other people getting, while you don't. There is no giving up." NO_JE_30F

"A farmer is the most hopeful person." TC_NCA_35M

The last chapter introduced environmental issues in the study area and the most important actors. This chapter focuses on agricultural dynamics. After having been side-lined for a while on an international level, agriculture has been again on top of the agenda in the last years. There has been renewed interest in agriculture in the midst of fears that climate change will decrease the global food availability. Several studies and reports on the future of agriculture have been written (World Bank 2007, Morris et al. 2009, Government Office for Science 2011) and FAO is running a ten years programme on mitigating the effect of climate change on agriculture (MICCA)[63].

The main economic activities in Nyando district are agriculture, fisheries, processing of natural resources and small-scale commodity exchange (Swallow/Mungai 2004: 5). While agricultural production is seen as providing the opportunity to address poverty, at the moment the district is not yet food secure and is a net importer of food (JICA/MoPD 2005). The table below shows the production deficit in the district (Table 9). Maize, sorghum and millet are the main food crops grown in the area, but cover only half of the demand. The total acreage under food crops is 182 km² and for cash crops 240 km². The area available for agricultural expansion is 276 km² (RDP 2006).

Crop	**Deficit**
Maize	514 826 bags (one bag is roughly 90kg for maize)
Sorghum	98 934 bags
Beans	198 320 bags
Rice	83 233 bags
Finger millet	15 867 bags
Ground nuts	31 525 bags
Cassava	7050 tons
Tomatoes	17 571 tons
Kale	46 235 tons
Bananas	11 649 tons
Local vegetables	68 13 tons

Table 9 Food production deficit in Nyando District (RDP 2006)

[63] http://www.fao.org/climatechange/micca/en/

The recorded area under crops and the harvest achieved (Table 10) varies from year to year, probably depending primarily on rainfall and available input such as labour power or seeds. Table 10 shows the areas under crops and the yields achieved for maize, sorghum and rice. However, interpretation of the data should be done with care due to poor recording (JICA/MoPD 2005). Local vegetables such as e.g. amaranthus (local name: *ododo*), spider flower (*dek*) and black night shed (*osuga*) are especially important during dry spells.

Crop	1998	1999	2000	2002	2003	2004	2005 (provisional)
Maize [ha] Maize [t]	7,465 18,812	9,351 12,399	7,747 11,633	9,921 14,250	11,928 20,997	9,513 12,49	9,736 17,525
Sorghum [ha] Sorghum [t]	3,444 5,579	5,771 5,194	4,207 3,786	5,471 4,421	5,625 7,562	4,213 4,517	4,942 6,672
Paddy Rice [ha] Paddy Rice [t]	810 4,517	1,983 5,252	855 2,582	859 2,256	625 1,643	1,322 4,098	NA 7,055

Table 10 Trends in main crops grown (Source: Annual Reports, Nyando District Agriculture Office, 1998 – 2005, adapted from JICA/MoPD 2005)

After a short presentation of the agro-economic development in the region since the early 20th century, the study zooms in on local manifestations of changes in agriculture. Social aspects that are influencing farming and the prospect of small-scale agriculture in the area are discussed. On a more theoretical level the question is how change is impacting on the farmers and to what extent changes can be explained through natural or social factors. By doing so, this chapter presents some aspect of SNR in more detail and discusses the contribution of risk and resilience for presenting and assessing them.

6.1 *Agricultural-economic history and introduction to the villages*

This section describes how agricultural developments in the region can be understood as being influenced by ecological conditions, as well as the broader social, economic and political contexts. Some knowledge of the history of a study area is important to meaningfully describe longer-term dynamics, as e.g. differentiating trends and variability and further in order to reflect on seemingly self-evident (sometimes framed as ‘natural’) facts (see e.g. Chapter 5.2). Such short historical accounts however have to be treated with care (see Stump (2010) for a critical reflection), and no simple conclusions should be drawn.

The Nyando basin has a complex history of settlement, irrigation development and land tenure over the last 150 years or so. The major migration to the Lower River Nyando Basin took place around the mid and end of the 19th century (own inquiry). During that time, labour power was one of the main constraints for settlement and wellbeing. At the end of the 19th century the Luo were still mainly pastoralists. It was only with the onset of colonialism that a major conversion to an agricultural economy took place. During that time people were encouraged to build on agriculture as their main livelihood (Buttermann 1979).

Colonialism brought rapid changes to the area, including, among others, a railway from Mombasa up to the shore of Lake Victoria in Kenya, which was completed in 1901. The subsequent settlement of foreigners along the railway marked the beginning of the connection to world economy and thereby also changed the agro-ecological dynamics[64].

The first years of colonial rule until 1914 can be seen as a time of prosperity (ibid.: 124ff) with tax demand being modest, while the selling of sesame to the international market in particular provided a valuable source of income. World War I and the collapse of the export market for sesame at the same time brought the first interruption of this wellbeing due to falling prices for agricultural products. Even after the war, the export of sesame never really took off again, as sesame oil was replaced by cheaper oil on the international market (ibid: 147f). While the main period of sesame as an important international trading product has been quite short, it still left traces: Even today at petrol stations, traders are selling sweet roasted sesame balls mainly to the local travellers. As an alternative source of income the cultivation of groundnuts started in the 1930s (ibid: 150), which is also still ongoing today.

Apart from international market relations, more regional exchange and relations played a major role for the dynamics in the area. The lakeshores had always been deficient in crops, and trading with the higher areas was a normal practice in many areas around Lake Victoria (Butterman 1979: 56). While the people at the lakeshore imported grain, they exported livestock to the highlands during droughts (ibid: 62). These trade relations became especially important during emergencies as can be seen in the impact of epidemics as well as rainfall variations. A drought in 1918-9 forced the Luo to exchange 60% of their cattle for grains, which they got from the Kisii living in the bordering highlands (ibid: 152). Together with epidemics like Anthrax, Rinderpest and Pleuropneumonia this changed the modes of production in the area and in the end boosted engagement in farming. For example, as a consequence of the cattle diseases, new root crops were planted as insurance, as they can be flexibly harvested at times of need. In the 1930s, the reliance on agriculture had intensified and it is known that at that time people were cultivating twice a year (ibid: 168ff). The emphasis on agriculture was further promoted by lack of employment outside of agriculture in the 1930s, which led to a return of many people to their rural homes.[65] The increase in agricultural activities was accompanied by the introduction of the oxen plough (ibid: 169), a major technical step forward. It is still used today (see Chap 6.4.1 for more details).

[64] The following brief history is mainly based on Butterman. More sources would need to be included for a more complete and maybe more objective study on the history of the area.

[65] The instability of outside employment was again felt after independence. This might in fact be one of the reasons to explain the strong attachment to land by the Luo. The ownership of land often served and still serves as main security people have for those kinds of losses of employment or for old age.

During World War II maize and sorghum became profitable crops, and at the same time stable prices for crops were offered by the colonial government, which allowed farmers to calculate expected costs and profits (ibid: 167 and 174f).

The situation changed again in the 1950s. The job situation outside agriculture was good, and the Luo have vital memories of those times, when many of their family members found jobs outside the agricultural sector away from the village and sent remittances back home. The longer colonialism lasted, the more 'willingly' the Luo integrated into the new emerging market outside of agriculture. The youth in particular strived for new goods in order to gain power outside the traditional sphere (Butterman 1979) and adapted to the colonial system.

In the 1960s-1970s agriculture did relatively well, with market prices remaining high (Maxon 2002) and the cereal boards offering higher market prices for maize and other products. The 1960s were a period during which the colonial governments invested in their colonies and saw their role much more in the area of development than in pure exploitation (Bernstein/Woodhouse 2001: 289). After independence (which came in 1963) support of agriculture was continued by the new government, which followed the inherited colonial model of state-led economic development (ibid: 289). Legovini (2002) reported growth rates of more than 5% in the agricultural sector in the 1970s. In the study area, the government mainly invested in the construction of rice irrigation schemes and sugar cane processing farms. The role of cash crops is vital in order to understand dynamics in the Nyando Basin. According to JOO_R_60M rice, sugar cane and cotton were starting to influence livelihoods and attitudes of people around the 60s. Rice will be dealt with in more detail in Chapter 6.2.4). The sugar sector had a short period of success from 1966 to the 1980s. Since the late 1980s cheap sugar imports flooded the market (Maxon 2002: 309ff) and there were serious problems with processing. In the 1990s a lot of sugar even dried in the farms without being harvested.

In general, the 1980s and 1990s are reported as having been relatively bad years for agriculture in general; with, among others, droughts and decreasing market prices leading to difficulties (Maxon 2002: 299). Since the 1990s up to the early 21st century, prices of cash crops decreased, while prices in crude oil increased, population grew and the negative impact of the HIV/AIDS pandemic were increasingly felt.

In the following the agricultural history and setting in the four study sites will be introduced separately in order to grasp the high spatial heterogeneity (see Table 1 and Figure 3 for an overview of the villages).

6.1.1 Nakuru village[66]

Nakuru village is situated around 6 kilometres (tarmac road) away from Ahero, the largest town in Nyando District. The majority of the homes in Nakuru are situated along river Ombeyi, which flows into the river Nyando. Nakuru came into existence during the establishment of the National Rice Irrigation Scheme in the late 1960s. At the time of its establishment, 150 people were settled there and each household was given a 50x50 m plot for the house and 1.6 ha for farming. The community associates this period with some negativity, since most of them lost large plots of land:

> "Before the scheme was introduced, we were having very big land. Now when the scheme was introduced, if you had owned seven acre of land before, you were just given four." GD_NAK

Rice farming did reasonably well in the beginning; however it started deteriorating in the 1980s and stopped in 1998. The irrigation scheme run by the National Irrigation Board (NIB) was revived in 2005/2006 because of the initiative of a few local people who attracted funds from FAO. The revival of the scheme took mainly place through food-for work programmes for desilting and went along with a cooperative, enforcing reduced government involvement. Despite bad experiences with the rice scheme, the population in general welcomed the new planting initiative; stating that in case rice farming proved to be promising all other competing activities would be reduced. At the same time, the farmers already started complaining as they found it hard to find a good market for their rice, as it had to compete with rice from Pakistan, which is sold at the supermarkets in Kisumu. Supermarket owners, however, said that quantity and quality of the locally produced rice was too low. Given that, maybe not surprisingly, in 2011 IRIN reported that eventually three-quarters of all farmers in the Ahero Scheme had switched to the production of Maize[67], while most of the national rice need is covered by imports from Pakistan under preferential tax terms.

6.1.2 Awach/Achego

The Awach/Achego area is also close to Ahero, around 9 kilometres away (partly gravel, partly tarmac road). It is bordered to the west by a permanent river (Awach) and is at a distance of around 12 km to Lake Victoria. In the area, rice farming on irrigation schemes, as well as smallholder agriculture and livestock keeping takes place. Rice was introduced into the area in 1972. Rice farming was less formalised and emphasised than in Nakuru and other livelihood activities were still common parallel to rice farming. As long as the government supported rice farming, recommendations to plant a high quality variety of rice were largely followed. After the support stopped there was a move back to a variety with a

[66] Not be confused with Nakuru (Town), one of the major Kenyan Cities in the Highlands of Kenya

[67] http://www.irinnews.org/report.aspx?reportid=93367 (last accessed in Nov 2013)

higher yield, but a lower market price per kg (which provides for food security in case no market can be found).

The history of crops (especially maize and rice) has seen ups and downs, with yields varying considerably due to droughts (1995, 2002) and floods (1996/97). Apart from natural factors, labour input is seen as a major factor which led to an increase in yields in 1999 („people saw the need of working“ GD_ACH) and 2003 (“people were about wise” [they were working hard] GD_ACH) or the introduction of new crop varieties (Maize in 2004). Reportedly, new crops varieties have been brought to the community quite regularly (sorghum, maize, finger millet). Yield increase in 2005 was specifically attributed to a new and better growing variety of maize. Diversification of crops is reported as well. Since the late 1990s the cultivation of beans, green gram (also known as mung bean) and sesame is reported to have increased. The same is true for tomatoes, which are now an important source of income for the villagers. One reason given for the increase in tomato production is training on kitchen-gardening the community received in 2003. While the production of ‘foreign’ crops increased, sorghum and millet are said to have decreased due to the dislike of the local population. According to the community, sorghum was grown ‘as something to help’, which is not planted nowadays because rice and maize took over. The low production of millet was explained by low popularity as a consequence of missing ‘juices’ (gravy) from meat with which to eat the millet. Livestock is reported to have been going down since 1999, due to diseases, droughts and floods, as well as sale for other use (need for money).

> “Last year 2005 our livestock had it roughest not like before. There was very serious drought and so most animals had to be slaughtered. They died in the 10s and 20s because of the drought and so their population automatically went down.” GD_ACH

The area is drier than Nakuru Village (which is close to the River Nyando and Ombeyi) and as well as Kakola-Ombaka (which is close to the lake shore). Parts of the area are vulnerable to floods, but many of the housing areas are on a raised terrain, and are relatively secure during normal flood events.

6.1.3 Kakola-Ombaka

Kakola-Ombaka is situated around 12 km away from Ahero (mostly gravel road) close to the shores of Lake Victoria (houses in the location are situated around 20-40 min walk away from where the fish catch is landed). The road to Ahero becomes partly impassable during the rainy season. People came to the area in 1912. At that time the river Nyando meandered close by, depositing silt. People stated that the flooding started in 1939. Heavy floods in 1962-63 as well as in 1997 made people migrate to higher areas.

Kakola-Ombaka is less characterised by one major crop than the two areas above. Sugarcane and vegetables are the important cash crops in the area. From 1996 to 2006 people

mention a decline in opportunities to sell the cane to industries. During the time that sugar cane could not be sold, some was partly used as firewood. When visiting the area briefly in 2010 an Indian company had started coming to the area to buy and harvest the sugar cane, which boosted this enterprise again, as the Indian company was seen as being more reliable than the Kenyan ones. The acreage under sugar cane is expected to increase in the future, due to on-going revival of sugarcane factories.

A source of income with increasing significance is the production of horticultural crops (mainly kale, tomatoes and onions) close to the wetlands near the lakeshore, which is possible all year round. For this activity, large areas of wetland were burnt between 2006 and in 2010. The wetland furthermore serves as a refuge for cows during severe droughts. In addition to horticultural products people use the selling of livestock, thatching grass, mat making and fishing as alternative sources of income, especially during the dry periods.

Food security is said to have gone down due to an increase in population; as well as a decline in yields[68]. AL_K_75M and LA_K_50F report a decline from from eight to only four bags per acre (1.7 t/ha to 0.88 t/ha)[69]. Decline in yield is attributed to a decline in soil fertility, the lack of certified seeds, and to a lesser extent to more frequent droughts and floods:

> "There is no soil fertility due to lack of advice concerning crop rotation. We don't use proper style in agriculture and so we don't plant different crops as is required." GD_KAO

While people in Achego did not see land scarcity as a problem, in Kakola-Ombaka some mentioned it:

> "You find that in those olden days, one person can own a big land whereby now it's very rare to find one person owning a big land. Where we practiced agriculture before has become homes where people live and so we have low yields." AL_K_75M

The number of livestock (cattle, goats, and sheep) is expected to decrease in the future, as most of the land is expected to be cultivated or turned into homes.

6.1.4 Nyakach/Jimo-East

Jimo East is situated on the lower slopes of the plateau to the south of the Kano Plains around 20km from Ahero (and 6.5 km from Katito). Nyakach was one of the main areas of cotton production some years back. The production of cotton had been tried in the area;

[68] On a local level the measure given in order to decide whether the harvest is good or not, is the capacity to fill the household granaries: "Twenty years ago, we had good yield compared to now. Our forefathers where having many benefits but in these days we are having famine and many other problems. I think the yields back then were better. You would find granaries full, so that the stocks were even given to those who aid in weeding as payment." GD_KAO

[69] For all of Nyando (based on Table 10) an average of 1.8t/ha (8bags/acre) for maize and an average of 1.35 t/ha(6 bags/acre) for Sorghum can be calculated for 2005; with one bag being estimated to contain around 90 kg.

however it never really took off in Kenya, due to the heavy labour requirements and the low prices on the market (Maxon 2002). Castro (1998: 1723) shows how the government of Kenya tried several times to establish different districts in Kenya as cotton zones and equally several times was disappointed.

> "Cotton cultivation could not continue because we lacked good markets and we had to buy seeds, but could not sell it to good buyers. The buyers only offered KSH 8 per kg. […] So we were forced to cultivate other crops which would be of more value to us." CO_J_80M

As no other cash crop was introduced after the collapse of the cotton industry, poverty increased. Other main sources of income are the harvesting or processing of sand, marram, clay (for making pots and bricks), papyrus (for mats) and sisal (for ropes). However, ropes and baskets are increasingly fabricated with plastic and are a preferred livelihood alternative to farming (Mugo 1999). The products are sold at Sondu market (9km away).

The main food crops cultivated are millet, sorghum, potatoes, maize and pumpkins. Farm yield from 1960s to now are seen to have been going down and numerous reasons are mentioned for this development. People are aware that certified seeds could double the yield per acre. Manure is seldom applied. Constraint is seen in a lack of ploughs so that farmers cannot prepare the fields in time.

Rainfall variability is seen as an important 'natural' problem for crop production. Other problems that have been mentioned are Striga weed and loss of soil fertility (top soil degradation and erosion[70]) for numerous reasons. Deforestation due to charcoal production is seen as an important problem[71]. In addition, overgrazing due to a loss of access to farm land along the lake shores is also viewed as problematic since the demarcation of land in 1975. Land demarcation is blamed for having forced people and livestock to use the same path over and over again, thereby created starting points for severe erosion. The demarcation and sub-division of land is further said to encourage 'cross contour ploughing' which makes the fields more susceptible to erosion.

Wrong management and missing commitment are blamed for environmental destruction and low yields as well. The reason given for the wrong management ranged from missing knowledge, missing data, or missing means (labor, money) as well as problems within the community. Some farms lay fallow, because the labour force is missing, as people are look-

[70] Erosion in the area is reported as having started around the 1960s/70s (see Chapter 5.2 on the Katuk-Odeyo gulley in Jimo East).

[71] Numerous initiatives going on in Nyakach try to reduce erosion and increase soil fertility through the planting of trees: "Personally I have a site where I have a tree nursery. Visitors from various places have visited the nursery. We plant tree that are seen practically. I have even received things like seedlings, wheel barrows and other material." CO_J_40F (see Chapter 5.3. as well)

ing for jobs in towns or in commercial agriculture areas, or other projects, such as e.g. the construction of a hydro-electric dam some 30km away.

The following chapters will discuss those aspects in more detail.

6.2 *Agricultural variability and change*

> "It is just like fishing using the spear: if you are lucky you will get." CO_DAO_G_N_40M
>
> "Here are so many different pests, so many ways the money can get lost." JM_70_M

The farm history in Table 11 (next page) gives an introduction to the variability of problems of farming on a yearly basis and at a local level. It shows the crops planted, the yields received and the numerous dangers, which are threatening the yield.

The reasons for low yields on that farm can be basically grouped into problems of input (human labour, money, oxen), weather related problems (droughts or floods) and problems of organisation (timing of planting), as well as loss of yields due to theft and wild animal attacks (goats and cows, which are not adequately attended, can destroy crops as well). Stealing of food crops is said to be mainly done by people from within the community, while raiding of livestock is mainly done by people from the neighbouring communities.

Based on the insights so far the following factors have been selected for discussing agricultural dynamics: rainfall (Chapter 6.2.1), the impact of new seeds (Chapter 6.2.2), lack of input and its' relation to changes in the society (Chapter 6.2.3) and cash crops, intensification and market exchange (Chapter 6.2.4). The on-going changes and the reasons behind (nature/society, internal/external) will be described. Chapter 6.3 and 6.4 will then deal with the broader setting within which agriculture takes place. Chapter 6.5 will draw some conclusions with regard to the value of looking at the multitude of factors and thereby also the value of case studies and the contribution of the concepts of risk and resilience to describe socio-ecological dynamics.

History of a farm in Nyakach/Jimo East from 1996 to 2010 (CO_J_40F)	
1996: maize, sorghum, green grams	No Problems Yield was good since it was the first yield from the new farm.
1997: maize, sorghum, cowpeas, green grams, groundnuts	Problems: early drought, inadequate income for weeding, illness of the father Yield was poor because of the factors mentioned above
1998: maize and sorghum	Problems: Not enough oxen, inadequate income for weeding, late planting Yield was not so bad, because faster maturing varieties were planted to deal with the delay
1999: maize, sorghum, cowpeas, green grams	Problems: thieves Yield was good, weeding done twice, rain conditions favourable
2001: maize and beans	Problems: Striga, water logging in some parts of the farm Yield was down because of Striga and water logging. For the unaffected areas the yield was fairly good.
2002: maize, sorghum, beans	Problems: Inadequate rain, Striga, lack of oxen and late cultivation, loss of wife Yield was low due to rainfall, Striga and late cultivation. "We only managed to get good yield on the second cultivation in the month of August."
2003: maize, sorghum, cowpeas	Problems: Oxen not enough, sharing labour with many people. Therefore work on the own farm was delayed. "Yield was not bad, we weeded twice, rains were favourable"
2004: maize, sorghum, green grams	Problems: Late cultivation, inadequate income, thieves "Yield was poor because this is the year my mother died and I spent a lot towards funeral expenses."
2005: maize and sorghum	Problems: Early drought, Striga, thieves "Yield was poor and even this little yield was stolen."
2006: maize, beans, sorghum	Problems: illness, lack of enough labour, late weeding and Striga weed "Yield was poor because weeding was done when plants were almost mature; with beans I never got a recognizable amount since the weeds destroyed them."
2007: green grams, millet, beans in-between Millet; cowpeas	Harvest was not bad "What was failing us before was timing. When we plant earlier we get something."
2008: hybrid maize	Problems: theft, farming is fenced, people are forming groups in order to take care of security. Yield was good but monkeys and porcupine eat three quarter for the harvest, as she was the only one who had planted hybrid maize.
2009: millet	Problems: No irrigation and lack of labour "Yield was low as rainfall was too little "
2010: no crops planted on the downhill plot	Problems: Wife was sick since last year, so the husband was trying to get the daily meal through work with ICRAF.

Table 11 Farm History – 1996 to 2010 - CO_J_40F (own data, collect in 2006 and 2010)

6.2.1 Crazy weather – predicting and explaining rainfall variability

> "The weather is going crazy. People are no longer knowing when to start planting, how to do agriculture." DN_PAO_45M

> "Most of the time the climate doesn't favour agriculture, so people come out with nothing." EO_K_50M

> "Nowadays we are confused." GD_KAO

One important factor influencing agriculture is the rainfall pattern[72] (see Chapter 5.2 and Table 12). Weather conditions were seen as being responsible for a 50% reduction of yields from 1991 to 1992 in the area (Kisumu DDP 1994).

Reasons for low yields	Jimo East	Awach/ Achego	Nakuru	Kakola-Ombaka	Sum
Rain unfavourable + Droughts	10	13	2	3	**28**
Lack of inputs/did not cultivate all	5	9	4	6	**24**
Small farms	2	2	7	2	**13**
Late Planting	7	3	1	0	**11**
Climate change	1	2	3	4	**10**
Low soil fertility	4	0	2	1	**7**
Pests	4	0	1	1	**6**
Lack of weeding	6	0	0	0	**6**
Too much water	0	2	3	1	**6**
Wrong technique	2	0	3	0	**5**

Table 12 Reasons for low yields according to the household questionnaires (numbers of interviewees that mentioned the reason; own data)

Rainfall was already known to be variable in the early 20th century, with one agricultural year out of three being unsatisfactory due to erratic rain (Butterman 1979: 6f). However, this problem seems to have gotten worse. The weather is described as having gone crazy with rains becoming unreliable (see as well GoK 2010).

> "The point that I have is about the rains. In olden times and now, it's that in olden days it was raining in December while nowadays it is usually raining in February or March, so there is a difference." GD_NAK

People say that they knew when to plant, whereas now the rainfall is no longer predictable:

[72] While rainfall will be discussed here, there are other natural threats that influence agriculture. Pests, weeds, diseases and animals pose external threats to production, which are difficult to control. Birds might eat rice and sorghum, monkeys come to fetch maize, avocados and bananas; hippos or porcupines can destroy fields overnight; invasive worms, and locusts all pose a threat.

> "Back then rainfall was very reliable and predictable and people knew the months of drought and that of rains. So we planted in February, weeded in March because still there were no much rains and then in April it could rain very heavily throughout the country." DO_AW_70M

> "It has become a bit complicated. When I was young, we planted in February and had serious floods in April, but from 80s here, rain pattern defeated people. Nowadays people just plant as soon as there is rain. It's a pattern all over." TC_NCA_35M

One of the farmers I met put it like that:

> "Rain fed farming is gambling; you are just trying, there is a lot of uncertainty."

To deal with the variability of rainfall, three strategies can be differentiated: (a) better prediction and timing of the planting (knowledge); (b) water storage and irrigation, e.g. in water pans (buffer) and (c) appropriate plant selection (diversity of strategies). In the section below, prediction and timing are dealt with. Problems with seed selection are discussed in Chapter 6.2.2. Water storage is tried on a small-scale in different places but will not be dealt with in this thesis. Large-scale irrigation efforts have already been presented and small-scale irrigation as on option is briefly mentioned again in relation to the construction of dykes in Chapter 7.

One frequent issue discussed is trust in different sources of weather prediction. The Kenya Meteorological Department (KMD) provides weather forecasts (daily, weekly, monthly and seasonal) and the drought-monitoring Centre in Nairobi, the ICPAC[73] (IGAD Climate Prediction and Applications Centre), provides 10 day and seasonal forecasts. Seasonal forecasts are announced at the beginning of the short rains and the long rains. While there is hope that timely forecasts can be a key factor in boosting food production in Africa and many farmers have access to radios and newspapers so that information transmission would be easy, forecasting is seen as being frequently inadequate or even misleading. In the study area it was felt, that the existing national and regional 'science' based forecast could not improve the situation so far. For example, in December 2009 the KMD had announced heavy rains in the short season and farmers prepared their fields accordingly. However, as the promised rains did not come, their efforts were wasted. Unfortunately, this was not the first time this had happened; farmers were disappointed and lost even more trust in the announcements. Rarieya/Fortun (2010: 108f) state further that the language used in the forecasts is not readily understood by the farmers[74], nor is enough small-scale

[73] In 1989, the Drought Monitoring Centre Nairobi (DMCN) was established. In 2003, this centre was adopted as a specialized institution of the IGAD (Intergovernmental Authority on Development).

[74] An analysis of ways to communicate potential dangers would be useful here (for a theoretical discussion see Loefstedt (2003) who did argue for the importance of public trust in order to achieve greater success in the communication of risk).

data available, so the majority of the smallholder farmers do not receive or use this information.

In case farmers blindly follow the predictions of the KMD they give away local decision-making power and thereby they become depend on external forces, which might be a problem in case they lack the capacity to interpret the weather forecasts given out, or in case the KMD does a bad job. But what else could be used? Farmers have many indicators for the onset of rains. Among them are the following: (a) direction of the wind (sea breeze or land breeze), (b) arrangement of clouds on top of Nandi Escarpments; (c) lightening in the mountains; (d) feelings in the bones (similar probably to what is referred to as weather-sensitivity in Germany); and (e) movement of birds and frogs (JL_K_45M, BO_M_75M and EO_J_30F).

> "I heard you asking how we can tell that it is about to rain. When morning comes you'll see clouds gathering with lightning and maybe thunder recurrently. This is a signal to those who have not ploughed to do so because the rains are just about." GD_NAK

While some of these signs are short term: wind from East to West [i.e. from the mountains to the lake] in the morning is a sign that it is not going to rain; others seem to be more long-term "some birds, magungu, when you see them, it is not going to rain for a long time" (DA_N_30M).

This knowledge about rainfall signs, is referred to as being traditional, however, it finds its backing in scientific knowledge (e.g. convection leading to rain, which, in the case of the Nyando Basin, means that the wind has to blow from west to east in order to make rainfall probable). And while people have little trust in the KMD (see above), it is stated that in general "the traditional things still work" (DA_N_30M); even though some of the old rules with regard to weather prediction are said to have become less reliable.

Nevertheless, while in former days a versed elder, who had proven to be successful in farming (Butterman 1979: 54), announced the beginning of the planting time, nowadays everybody decides individually. Some follow traditions, others might follow the predictions of the KMD.

> "Whereas some years back people still followed traditions in planting, nowadays everybody uses the trial and error approach. You might get a good harvest if you start planting in December, or you might lose everything [...] one day someone already started to plant with the first rain." FM_VI_45M

> "Nowadays, people already sow in January, and once somebody was sowing in December, and his harvest was very good." GO_JE_30M

Apart from predicting variability, also explaining and thereby potentially getting the capacity to influence rainfall is important. Numerous reasons for the change in rainfall patterns are being discussed; social as well as natural factors were brought forward, internal as well as external factors. As extreme explanations the following two can be stated: (a) businessmen have been chased away, because people think that they prevented the rain and (b) some hold 'Saddam Hussein and the bombing' responsible. I cannot say whether these two examples of rather uncommon cause-effect relations can be found regularly in the Kano Plains, as no targeted research on that question was done. Although people were asked to state the reasons they see for the changes in rainfall, it can be assumed that many would not have talked about the reasons above, as even the few that mentioned those cases seemed to be ashamed and were busy stating that "they just heard" (TC_NCA_35M) about those cases.

More common are discussions about rainmakers and the belief in God, as being responsible for rainfall. There are conflicting interpretations of the knowledge, methods and power of rainmakers, with people using 'scientific' as well as 'belief based' explanations, to explain, how the rainmakers worked:

> "The community believes that rainfall is God given. A long time ago there were also disasters like droughts and outbreaks of diseases that caused cattle to die. During long time ago during dry season the community had to sit down and animals had to be slaughtered when there was a long drought. They had to sit down under holy trees "shrines" [holy places] and the animals had to be eaten and they prayed to god and the ancestors. And in many cases it helped. Just behind them [= just after the meeting] the rains started. Nowadays it is not done. They go to churches and this cannot be compared with our forefathers coming together. When you do it in church it will take two months until the rains will start. Now people believe in god and not in shrines and ancestors." PO_AW_80F

Some refer to rainmaking as *juju* (magic) and blame the problems of rainfall on the disappearance of the rainmakers[75]. When asked what rainmakers actually did, NA_VI_25M told me, that they were basically wise people who got their knowledge from studying the weather and animal behaviour for a long time and knew how to use this knowledge to make predictions and thereby get influence.

> "They would gather and compare notes and then make a forecast. They agreed that they could tell the people and did their rituals. And that's how they earn the title. You couldn't agonise them. They could tell people to do what they want." NA_VI_25M

Similarly an old lady said:

[75] I did not meet anybody who said that rainmakers still exist.

> "I lived with one of these witches, and when he was called one time to go help the people because there were no rains, I went with him. I wanted to see, how it was done. When we reached there, we first met snakes (huge snakes). But actually the witches did not do more than people are doing now; they studied the pattern and so claimed they could attract rains." GD_NAK

Hidden behind the ostensible discussion around the rainfall might actually be other discussions about what is seen as good and bad in general. A manager working for an international NGO (TC_NCA_35M) in the LNB said that he thought that the traditional gods were disappointed because of Christianity. During the group discussion in Nakuru the following discussion developed

> Community (C): "Trees were abundant, but still there was no rain and that's when the few elders of the village came together and sent some people to the gods to ask for rainfall and then it rained. That culture ceased to exist. They would offer sacrifices after the ceremony. There were very heavy rains."
>
> Discussion Leader (DL): "So we could say the rains came because of the Gods?"
>
> C: "From my point of view, since we are believers in God, it can rain at any time, but the old people believed in rainmakers and so it couldn't rain until the rainmakers decided it should. In those days there was traditional rituals performed so that the rains can comes."
>
> DL: "Can we say that the rains were good because of traditional rituals?"
>
> C: "God was the one bringing rains, he just sends the rains anyways, but the people believed that there must be some people who can also do it. People back then thought there were selected few who could bring rains, but that was not the case."
>
> DL: "This means that there is no difference between then and now?"
>
> C: "What I can say is that through believe, we believe in God. But our ancestors believed in communal rituals and rainmakers. So there is a difference between then and now."
>
> C: "Today, if there are no rains, all churches unit in praying to God for rains, but nobody goes to witchcraft."

Environmental management is seen as another reason for changes in rainfall patterns. A common reason given for the increasing rainfall variability and the increasing problems with the climate is the cutting of trees in the basin[76]. According to PO_AW_80F rainfall comes from the mountains and trees. A similar view was expressed during the group discussions.

> "In the olden days, there was good yield, because there were a lot of trees to attract rains, unlike these days. And since we started planting trees, I can say we now have rains." GD_NAK

[76] Cutting of trees is said to have started on a large scale for charcoal burning in the 1950s, when people did not find jobs after finishing school (JM_X_70M, PO_AW_80F), others blame the administration for relaxing the laws concerning tree cutting (GD_KAO).

> "We as community had sat down and thought why it always rained in Kericho and in Nandi hills and not here. We concluded that it was because we had no trees and so we planted trees due to training from various institutions and these days at least it rains and so we can harvest something." GD_NAK

> "There is also the issue of less rain due to destruction of land cover that has been done by the locals." GD_KAO

It should be noted that, while there is scientific evidence to support the idea that trees in a water catchment stabilise the overall water supply (e.g. through increasing the water holding capacity in the soil, as well as in the vegetation), the role of trees in attracting rain is difficult to account for (Sheil/Murdiyarso 2009). This however might be less important than the overall outcome or the strategy taken; which in this case would be the planting of trees.

Tree cover is also seen as influencing the intensity of the rains, with rains being much heavier now than they used to be (see GD_NAK below):

> C: "In the olden times the rains were not raining very heavy till it destroyed crops. Nowadays it rains heavily and carries away topsoil layers. That is the difference. The floods nowadays also destroy all the crops unlike before."

> C: "I have lived in Rift Valley and the patterns there are different from here. They have too many forests and have planted a lot of trees. So whenever there is rainy wind, the trees trap them and so erosion is not severe. We have nothing to trap the rains."

> C: "The earlier rains had a pattern, but these days it comes too heavy."

From a natural science point of view the question could be: did the community get the cause-effect relations regarding the reasons for changes in the rains right? However, in the example above it is not crucial whether trees make rains less heavy, or whether tree cover is 'simply' responsible for heavy rains having a less severe impact. The exact cause-effect relations are not important in day to day life, as long as people continue to plant trees and the problems of rains becomes less severe (e.g. erosion is reduced). Cause-effect relations might however be more important in case changes are taking place fast.

6.2.2 Knowledge about farming: seeds and schooling

> "Do you catch me? Or are we so much backwards? We are layman." JL_K_45M

> "Traditional knowledge has not been passed on. We had to go to school; we had to leave our parents. We didn't listen to our parents. So for example for drugs, we are using, what the westerners call 'conventional' and leave behind our 'conventional'." NA_VI_25M

In the following I will concentrate on knowledge in order to deal with changes in agriculture. The focus will be on the impact of the introduction of new seeds, as well as the impact of schooling on the knowledge that households have in order to deal with the problems they face.

When walking around in Achego, we met someone who told me, that I should help him, if only with advice. He blames the MoA for either not coming at all, or coming too late[77].

> "You know we don't have the knowledge. These crops and animals have various diseases. They require different attentions. We are also told that some crops can infect others and so would divide the farm into plots. So, we are advised to plant sorghum and maize on separate plots. They also tell us about planting trees such as fodder in rows such that if you have livestock they can feed on them row by row. This is beneficial for maize because stock borers that attack maize cannot exist where there is fodder such as Leucena. So such information they should give us, but because if they don't we have very low spirits in farming." AL_K_75M

On the other hand an old lady I talked to did not agree that they needed people from outside to teach them. She argued that their knowledge should be utilized by those (e.g. development projects) who come; "as people that come from outside only come once and do not even know the soils" (PO_AW_80F).

When asking the community what kind of information in agriculture is missing the following answers were given (Table 13):

Information on agriculture	Sum	Jimo East	Awach/ Achego	Nakuru	Kakola-Ombaka
Time of ploughing/timing/late rains	***16***	3	6	5	2
Where to get input/loans	***16***	4	5	3	4
Pesticides /Pests	***15***	6	3	2	4
General yield improvement	***13***	3	4	3	3
Seeds	***12***	3	1	4	4
Why harvests are poor	***6***	3	1	1	1
Livestock keeping	***5***	2	0	1	2
What to do when there is too much water	***5***	0	1	2	2
Market	***4***	1	1	0	2
Horticulture	***2***	1	0	1	0
how to use chemicals	***2***	0	0	1	1
How to improve soils	***1***	0	0	1	0

Table 13 Information missing in agriculture (the table shows the number of times an interviewee mentioned a problem; own data)

[77] These accusations of the Ministry of Agriculture (MoA) can be either a blame game, or rather a sign that there are communication problems. Indeed the MoA did change their approach. They reduced or stopped their field visits and nowadays follow a demand driven approach (as they call it), basically to say that farmers should come to their offices in case they need help.

Timing of planting and where to get inputs were the most common problems mentioned. Timing of planting has already been discussed in Chapter 6.2.1 and will again play a role in Chapter 6.2.3. Pests are especially a problem in Jimo East, where Striga is a constant threat to maize production. 'General yield improvement' as well as 'why harvests are poor' are very general remarks that already point into the direction of missing knowledge or information. Missing knowledge with regard to new seeds is discussed in the following.

With regard to the introduction of new seeds, I want to argue in the following that external interventions often do not sufficiently take site-specific circumstances into consideration and as they miss this information their intervention will have negative consequences. For example: even when having knowledge about how much rain a crop needs or which soils are best for growing a specific crop, this knowledge is not sufficient when information about the kind of soil in a specific place and the rainfall to be expected are missing. Furthermore, before introducing something new it needs to be made sure that the capacity to deal with the change exists.

The introduction of new seeds had substantial influence on livelihoods in the area. Most impressive is the success of maize. The first maize crop was introduced to Kenya in the 16th century; however only after the import of improved varieties did it start to spread extensively (Akech 2000: 215). Maize is said to have numerous advantages over traditional cereals; with the yield being potentially higher, the vulnerability to pests being lower and the storage being easier. However, it also has disadvantages due to its sensibility to soil conditions (water-logging or dry stress[78] and nitrogen availability) (Doggett/Jowett 1966) and the high susceptibility of maize fields to erosion, as well as due to the lower nutritional value of the crop. Cohen/Atieno-Odhiambo (1989: 64) describe maize as representing both progress and disaster. Even though maize is still favoured by a big part of the local population, they know that it is inferior to Sorghum in the above mentioned way. Following the experience of crop failure or low yields and declining soil fertility recently a return back to sorghum and millet can be observed (Akech 2000: 215f)[79].

One way of potentially improving the situation is the development of new seed varieties. However, in some cases the introduction of new seed made the situation even worse, as information about the kinds of seeds and their requirements are not readily available at the places were the seeds are sold, so that people "end up being confused" (EO_AW_40M). Therefore, which kind of seeds to use is controversial; some favour the old ones which are said to have been doing good, and others would in general be interested in the new ones,

[78] There are however many efforts to develop drought tolerant maize varieties; especially at CIMMYT the "International Maize and Wheat Improvement Centre" (http://repository.cimmyt.org/)

[79] In the study area, the cultivation of sorghum and millet was most pronounced in Jimo East which is lying along the slopes and therefore is most affected by erosion.

however complain that stockists are far and therefore access to the new seeds and information about them is insufficient (GD_JE). This does not only hold true for maize, but also for other plants. Many old plant varieties disappeared when hybrid varieties were introduced with a lot of promises. During a group discussion, the Kenyan lady moderating the session[80] started to lecture the people on seeds. She said:

> ”You must ask which kind of seed you get. These days you must ask because there’ll come a time they’ll want you to supply a specific variety i.e. KSA or if you have the old B.P: variety. So, you must be clever since different varieties take different periods to mature, are sold at different market prices. This applies to all varieties of seeds for various crops. You could be given a variety like 6 series that grows in Kabondo and Kisii and that requires a lot of rain. Don’t just take any seeds for the sake of taking. You can plant the seeds in a very large area and they end up failing and therefore you incur a big loss.”

In her little speech some of the uncertainties the farmers are dealing with became apparent. The discussion below shows some of the problems and disappointments going along with the introduction of seeds:

> DA_N_30M: “New and new seeds are brought. I don’t know why. This year they tell us plant this and this seed. Farmers are now confused; they can’t trace their own seeds, they are mixed up.”
>
> Me: “Whom are the farmers blaming for that?“
>
> DA_N_30M: “Farmers are just blaming the seeds. A few farmers have been successful with the seeds, but many farmers have not. Because some of these seeds require fertilizer, they require many things before you get a good harvest and farmers cannot afford[81]. And many of them are exotic, imported […]. There are so many seeds, that farmers are now confused, which seeds are better, which seeds are not good. […]You don’t know which one is good and bad. […] It is the same with seeds. Some of them are said to be drought resistant, the others are said to mature faster. But the yield is small. The yield is compromised.”
>
> Me: “So you think the seeds are worse than the ones you had before?”
>
> DA_N_30M: “Yes, you know what, I used to see my old grandmother, keeping the best seeds, hang them somewhere close to the fireplace and it was going on and on. But nowadays, many seeds have come to the market. There has been a mixture of seeds, seeds are not regulated. The new seeds that have been brought are not long lasting. They are hybrid seeds, there is no sustainability. You can’t grow hybrids for two years. I remember 15 years ago, we were growing

[80] I stopped working with her after this group discussion, because the discussion she was supposed to moderate turned too much into a seminar, where she was lecturing.

[81] According to Woodhouse (2009:6) the benefits of crop improvement for the poor so far regard especially the improvement of cassava; according to him hybrid maize has the disadvantage that it requires the purchase of the seeds and fertilizer, which puts a constraint on their utility for poor farmers.

> 511 then it moved to 512 and now it is 514. And now you can find five different types of seeds, which are all recommended being good, but the difference is the people who bring them."

While the decision-making options in general increase, the more seeds are available; the possibility of making confident decisions is reduced as not all the consequences of the decisions are known. It can be said that even though decision options increased, the possibility to take risks reduced, as people became depend on external experts to decide for them on the kind of seed to plant. External interventions would have to focus on sufficient information and access to resources in order avoid that communities become dependent on decisions taken outside. And in the end also become unwilling to try new ways of doing things.

In the study area aversion towards the new can at least in some cases be linked to bad experiences with external interventions. For example, the use of new seeds did sometimes yield lower harvests, as farmers were not advised on the selection of the right seed. In Kakola-Ombaka the community stated that they had already tried improved seeds and livestock, but they had been proved to be too expensive and vulnerable to diseases and pests and too demanding (e.g. weeding or feeding requirements) [82]. Similarly, when asking why the villagers were not planting trees, even though they clearly stated they were aware of the benefits, the most common answer was: "we tried, but it didn't work" (GD_JE). On a closer look however the few successful examples of tree planting show that it is possible in theory, but that half-hearted or misguided implementation has led to failure.

> "One of the general problems here is, that people are doing a bad job and then they get the feeling that it doesn't work. All the modern things create high expectations and then people are disappointed." GO_JE_30M

What is interesting in this context from a more practical point of view is to understand how knowledge and information can be transmitted and how the transmission changed. The role of schooling for farming is important here; it will not only influence knowledge about basic processes and information about new developments (e.g. new seeds and diseases), but also the attitude towards farming as will be discussed in Chapter 6.3. When talking to people they remember the 'olden days' as a time in which the elderly people were like teachers and it is argued that with schooling some of their knowledge got lost:

> "Older generation left with the knowledge, because the younger generation looked for wisdom." AL_K_75M

> "Education alienated people from agriculture; young people don't have interest in agriculture, they don't see agriculture as something that can sustain you." AO_NGO_45F

[82] Similarly, a challenge for the (re-)introduction of crossbreeds are bad experiences that people made in the past.

> "During those times, the elderly were like role models, so we followed their footsteps, the younger generation was seeing, but when school came, they centred their mind in schooling; they lost their mind on farming. […] Going to school is good, but the child must be taught how to cultivate crops and doing agriculture. Children today have lack of knowledge because even in the schools were they go, when they get back home they only want to read their books and do not bother to know much about other things. They forget about home and farming and only think of the city. They don't realize that land has treasure and when they are forced to come back home, they have to sell all their assets in order to survive. So the only way to help them is to teach them all these things right from the house they live in. Education is good, but the only other better thing is farming." DO_AW_70M

However, schooling, in the case of transmitting the 'right' knowledge and important information, can be directly beneficial to agriculture. The NGO CREPP (see Chapter 5.3) worked with experimentation fields in schools in order to transmit knowledge.

Schools are only one of the places where knowledge can be transmitted (others are e.g. clinics and churches). Information sharing, often combined with decision-making in areas such as agriculture, water, roads and security, takes place at the chief's *Baraza*, as well as during diverse meetings, such as the National Irrigation Board (NIB) meetings, funeral meetings, the councillor's meetings and group meetings. While *Baraza* used to be one of the most important 'institutions' to exchange information, it seems that they are no longer as efficient for transfer as they used to be and attendance is going down. Radio transmission and newspaper articles are two other ways of transmitting knowledge and information. Out of 81 households that were interviewed in the survey 74% had a radio and at small shops in Ahero it is possible to read the newspapers for a small price.

Changes, such as the introduction of new seed varieties, as well as loss of 'traditional knowledge' make transmission of knowledge necessary. So far it seems not enough has been achieved with this regard even though quite some training projects do exist (Table 6). And what was shown above, in case new seeds (or livestock etc.) are introduced without sufficient information, they rather decrease the number of confident decisions that farmers can make, which makes them depend on external decisions or interventions.

6.2.3 Poverty, solidarity and the oxen plough

In this chapter I will scrutinize the role of missing input as a reason for poor yields[83]. While lack of knowledge is often addressed as the most important reason for low yields by exter-

[83] In a study by Place et al. (2005) for Western Kenya 33% of the households stated laziness as cause of poverty, followed by "no-one to help" and "unemployment" (each 30%) and alcoholism (26%) (all other causes were mentioned by less than 15% of the households). What would be interesting here is to pay attention to which extend those problems can be controlled internally and whether the blame is put on the external threats or on internal decision-making.

nal agents (as has been argued above and as can be seen in the quotation below), at the same time in the statement below, the problem of missing input can also be identified.

> "Many farmers are lacking basic agronomic skills. Most will be found planting low-yielding seed varieties, at incorrect spacing and up and down hill. Timing of operations such as weeding is often sub-optimal and done when the crops have been suppressed by weeds for too long and are unlikely to regain any significant momentum for growth. […] Very few farmers use commercial fertilizers because of its cost and the risk involved. Further very few use manure and those who do, apply it in insufficient quantities because of unavailability. […] It is now possible for farmers to grow more productive, more disease resistant crops. Farmers must be made aware of these opportunities if they are to move from the current cycle of poverty." Mburu (2004: 10)

The role of a lack of information about rainfall variability has been discussed above. But, even though people stressed that problems of timing in planting comes from a lack of information, one of the reasons for poor timing is actually missing equipment, as becomes obvious in the following.

After a discussion on the role of rainfall variability, when asked again, whether or not people really did not know when they should plant, the members of the community in Nakuru replied:

> "We used to plant in December and the seeds would remain in the ground waiting for the rains. So by the times rains came in January 1st they found all crops intact. And so we couldn't miss the rains. And in case the rains delayed, we would plant again on February 2nd to 9th and then we were sure of good harvests." GD_NAK

The acknowledgement that people used to plant again in February, in case needed, points to the fact that they had more seed grain in stock and were thereby able to buffer some rainfall variability. The introduction of hybrid seeds might play a role here:

> "Two cups of maize [of the old variety] would be enough to keep you alive ["forever", as it is possible to replant]. Nowadays you buy maize for 250KSH and it will only help you for two years." GO_JE_30M

Also other material is missing:

> "It is because of poverty. One could know when to plough but lack the capital to do so." GD_NAK

The group in Jimo-East was asked as well whether they are affected by changes in the rainy season; i.e. that they expect rains in January but instead it rains in March. They replied similar:

> "We might know that we are starting the year January, and it found when you have prepared because people have got different facilities but some do lack the facilities." GD_JE

> "Just adding on top of what has been said; we can know the time of the rains but if it rains and you lacked facilities, the rains will just pass without you benefiting, this is due to lack of important facilities." GD_JE

Actually many people do not work on farms, because they do not have the capital to start farming. According to EO_K_50M, most of the farms are lying idle because of lack of machinery and poverty and there is a lot of difficulty in maintaining farms because of missing materials and missing oxen.

Those who manage to plough and seed might still end up not being able to apply pesticides, insecticides or miss other important inputs.

> "I tried to do tomatoes, but got stuck in the middle because I was lacking chemicals." GO_JE_30M

> "At planting time there is not enough money to buy hybrid seeds; thereafter there is not enough money to buy insecticides and this is how it continues." LA_K_50F

But where does this lack of input come from? One reason for an increased input might be land degradation. While lack of land was not frequently mentioned as a problem, it was stated that not all land could be used because of it 'being exhausted'. Loss of fertility and the influence of weeds make more investments in agriculture necessary. The loss in fertility can indirectly be linked to a lack of land, or missing inputs and vice versa.

> "We have no land to go somewhere else to let the farm rest. In the olden days we were doing what is now called shifting cultivation. We were not farming the whole land. Some land was left for grazing and to accumulate manure." AL_K_75M

In fact, while old people say that farm implements some time back were not regarded as being necessary (PO_AW_80F), a lot of land is referred to as lying idle and impossible to be farmed today, because of missing inputs (GD_ACH).

Apart from soil fertility also changes in the society can lead to a lack of input. One reason seen for the lack of input is the connection to markets and the introduction of a money economy. Butterman (1979: 178) argued that already in the early 20th century granaries began to disappear, as a consequence of the introduction of money and migrant labour. Men now worked with cash, which was spent very fast. This might also explain why there are many aspects in which the living standard went up, while general food security went down.

> "So, that I can say, that there is a gradual growth in the standard of living, because there is that thing of electrification and many roads have come up. People are now able to move very fast. There has been improvement in communication." DA_N_30M

> "We should be able to become rich, but it depends on how you use money. Saving money is out of our dictionary." JL_K_45M

> "They are funny our people. The problem with this our people is, that they will sell the maize at the time of harvest, because they need money. Some they will even sell all their maize and start stealing thereafter. When they come from the market after selling, they will come with nothing, because they were drinking changaa." MO_M_50F

In how far could input shortages be buffered by social cohesion and solidarity? Solidarity and love were used as expressions to describe changes in the society. They were brought together with memories of a glorious past[84]. The past is remembered as a time in which people were working on their farms but did not sell their products, so that food shortage was not experienced. Granaries are remembered as having been full, with dried meat being easily available.

> "In those olden days people were having wealth and rich. There was a lot of wealth. We could get everything at the time we needed. There was food such as Milk, Sorghum Millet in plenty. ... We were also keeping some food for future use. We were not selling food. In times of food shortage we were used to fishing. We also had other foods in stock so we didn't have to visit the market every now and then. We kept stocks of dried fish so we didn't buy fresh fish. " PRA_ACH

Together with that abundance, there are memories of wide spread hospitality, with people welcoming visitors and sharing what they had.

> "Food was stored in large quantities such that we were never worried of improper visitors because we even had ghee[85] stocked in the house. […] Like for example, if the yields were good, like they are this year, I would brew beer in my home and prepare a lot of food and then invite everyone for a whole day of celebration. […] Back then the only means of transport was trekking. In case you were thirsty on your way to wherever, you could easily pass by the nearest home and ask for water. Or would be given well-prepared porridge first and later the water if you still needed it. They would even inquire your background, your destination and in case it was still miles away, they would request you to rest your feet first and start the journey later. This promoted a lot of friendship and goodwill among people, such that one could even get a wife or husband from such relationships with ease. " DO_AW_70M

> "During those times, I myself could give my nephew a cow to take to his wife's place as a dowry, which is not happening nowadays. Back then, if you were my brothers' son and you got married, I would easily give your wife a piece of land to farm for good. In polygamous family different wives would have varying numbers of plots, depending on their strength in farming. So it is their husband who would decide who gives out a plot to one of his brothers' son to work

[84] I could not assess whether "the good old time" really existed, but as long as they are real in people's minds, they have social relevance.

[85] Some kind of butter

> on for good and so promoted the love among them. If one of my uncles had an ox plough and we didn't have, we were sure he was going to plough for us free of charge." GD_ACH

Above a situation of sharing is described. In Achego the current situation was described as follows:

> "Today people only want what is theirs but love requires that we share with those who don't have. It is not around here anymore. Those days there were no problem, people were happy, they could plant and harvest. There was love between them; they could go to someone to be together the whole day and nobody asked what you would be doing. Food was just shared with everybody, but these days they can even hide food from each other. […] There is no love because a person cannot help his friend in times of problems."

According to the District Agricultural Officer (CO_DAO_N_40M), the problem of birds eating the short-term variety of sorghum could also be improved through social cohesion. If all farmers grew the same crop, birds would not be able to do as much damage to one farm, the threat would be spread over the whole are. Furthermore, when coordinating planting it would be easier to organise people to watch the crop and scare the birds in groups, which could help in dealing with labour shortage (Figure 12).

Figure 12 Farmer guarding his rice filed to scare away birds (Picture: own, Nov 2010)

The example of the oxen plough below shows the impact of a new technology on society; its' relation to lack of inputs increasing wealth differentiation, solidarity and distrust. The oxen plough (see Figure 13) was introduced to the area in the 1930s (DO_AW_70M).

However, it is still scarce up to today. Nevertheless, nowadays few people are willing or find it profitable to plough by hand, so that many who do not have an oxen plough these days, feel that they depend on borrowing one from somebody.

> "Before the oxen plough was introduced, digging started as early as September. People were doing it with hoes. Now everybody is waiting for somebody to be helped with an oxen plough and so the work is not done." PO_AW_80F

> "Those that are preparing now are those that have cows for digging." EO_J_30F

> "Now there is a problem because people lack farm equipment, e.g. tractor, oxen plough etc. It is difficult today. A long time ago people had no oxen to plough, but worked very hard, and one could weed on their own a very big piece of land without exhaustion. But today, people are so lazy and less motivated. " DO_AW_70M

Figure 13 Farmer explaining problems with the plough he has inherited from his grand-father (Picture: own, November 2010)

Depending on somebody from whom to borrow a plough, leads to delays in the preparation of fields. While in theory it is possible to pay somebody to do the ploughing, the costs of ploughing are high: ploughing one acre costs 2500 KSH when done with a tractor (not negotiable) and 1500 KSH when done with an oxen (here the price is negotiable and I was told, that it can go down to 1000 KSH when somebody is poor)[86]. However, paying somebody to do the ploughing is often not seen to be a feasible option, as one cannot be sure to get a harvest (GD_JE).

The plough serves as a mode of differentiation between wealthy and capable farmers and those who have to plough by hand. Butterman (1979: 170) describes the oxen plough as having changed "redistributive and reciprocal relations between individuals". Often, lending a plough or the necessary oxen to others is only done after one has finished ploughing one's own fields. One farmer I met had a deal with one of his neighbours to borrow his oxen to do the ploughing on his field. The deal was that he would first have to plough the fields of the one that was offering the oxen, before ploughing his own fields. What happened however, was, that as soon as the farmer, had finished ploughing his neighbour's field, he was denied the right to use the oxen for ploughing his own fields. Unfortunately, it was not possible to interrogate the farmer as to why he could not find any support to help him to enforce his rights; and no statement can be given here, about the frequency of

[86] The price for Maize was approximately 20KSH/kg in 2006 and the average yield somewhere between 0.2-0.7 ton (2-8 bags) (see Chapter 6.1.2).

these or similar occurrences. For the affected farmer it can however be said that his willingness to engage in sharing and exchanging (e.g. of work) has been reduced. In brief, the problem of scarcity of input is worsened by social issues, such as distrust and a loss of solidarity or social cohesion.

> "There is a lack of oxen, as people don't want to come together." (P_JE_80M)

Equally in Kakola-Ombaka it was stated:

> "What happens these days is that in these groups we can do fundraising to help solve a specific issue. But what happened earlier was an individual could volunteer on his own to give his brother's son cows to get pay the bride price. This kind of heart is not easily found today." GD_KAO

The lack of input for agriculture in the area is related to land degradation which makes higher inputs necessary, but also - and maybe mainly - related to social changes. Community solidarity and co-ordination could help in reducing the work load, however it is decreasing. Furthermore, similar to the introduction of new seeds, with the introduction of new technologies, an active decision-making to do ploughing or not was transformed into a dependence on external decisions (will somebody come to help me with a plough?). A risk was transformed into a threat. Even though people could still plough by hand, this is not seen as an option; therefore they might at least feel like they depend on external goodwill.

6.2.4 Intensification and land consolidation

In the following, I will discuss the impact of intensification, cash crop production and land consolidation (as an effort to increase the income from farming).

The Ahero Pilot rice irrigation scheme in Lower River Nyando Basin run by the National Irrigation Board (NIB) was an attempt to intensify one farming method. It came to be fully operational by 1969. Within this scheme farmers had restricted access to land and had to abide by strict rules for its use. Preference had to be given to rice production and farmers were neither allowed to keep poultry and livestock, as they could destroy the rice plants, nor to plant bananas or trees higher than six feet to avoid attracting birds which would feed on the rice. Furthermore, subdivision of plots was forbidden (Swallow et al. 2005). Even though these rules were later weakened and the villagers were allowed to keep some livestock, rice remained the dominant crop until the breakdown of the scheme in 1996:

> "Later, we won the battle and we were free of keeping poultry and livestock because they were helping us much. We were allowed to have four bulls for levelling. In order to graze you were required to have a permit." GD_NAK

People in the schemes of the National Irrigation Board were seen as tenants, and were provided with seeds and fertilizer on a credit basis, which was recovered when the harvest

was delivered. In contrast to that in a small-scale rice irrigation project in the region (e.g. close to Awach/Achego), which was supported by the Provincial Irrigation Unit (PIU), farmers managed the plots themselves and the rice production was just one of the activities that the farmers pursued (JICA/MoPD 2005). Disregarding those strict rules who were meant to assure high yields, the production levels stayed below the target (Maxon 2002: 314f) and the scheme remained dependent on external support (ibid: 299). Apart from low production also misunderstanding between the NIB and the farmers lead to deterioration of the scheme (Maxon 2002: 316). Rice production stopped at the end of 1999 due to poor maintenance and the breakdown of the motor-pump of the NIB. The floods in the El Nino years (1997 and 1998) can be seen as the final trigger to closing down of the schemes (Jensen 2009: 74f), as they led to even more intensive siltation of the canals of the paddy fields (see Chap. 5.2).

Swallow et al. (2007) conducted a study on poverty dynamics in rice producing areas from the 1980s up to the early 21st century, thereby capturing the impact of the collapse of the rice scheme. Poverty is said to have increased from 40 to 60 % in this period. Swallow et al. compare the scheme of the NIB with the one supported by the PIU, as well as with poverty dynamics in smallholder mixed farming areas. They argue that in the NIB schemes, the policy of intensification left the population with only a limited number of livelihood strategies (see Table 14 below) and therefore made them vulnerable to the breakdown of the rice production. Before elaborating on this in detail, I briefly describe how people in Nakuru remember this time.

During the time of non-operation of the scheme, people ventured into various businesses such as 'omena' (small fish) trade, trade with firewood, transport (matatu and bodaboda), livestock rearing, local brews, bicycle repair, tailoring, masonry/carpentry, employment (causal and formal). It is said that people used a ´merry-go-round´-style credit system[87]. In the agricultural sector, people were allowed to plant other crops and started planting maize and sorghum, as well as kale, tomatoes, cowpeas and beans. Livestock population increased as well, but was still low in 2006 because of limited grazing area. Chicken, however, were kept in larger numbers, as they do not require a lot of capital investment and can easily be integrated into the household activities. Despite these activities, overall income as well as food availability is said to have decreased. As a response to the hardship, changaa (a locally made alcohol) consumption increased:

> "Like for us youth, our main problem was that we had not place to go very early for work and so all we thought about was drinking; idling by the roadside to keep ourselves busy." GD_NAK

[87] A micro-finance activity by which a group of people come together with each member contributing a small amount of money at a time. This money is then given to one member of the group so that he can make a substantial investment.

This is said to have caused the people to engage in prostitution and promiscuity; finally exposing the whole village to the wrath of HIV/AIDS. These days a majority of homes are headed by widows or widowers, which is blamed on HIV/AIDS. Falling ill and dying is also attributed to a general lack of a proper diet or proper health care (GD_NAK).

Coming back to the claim of Swallow et al. (2007) I will discuss, how diversity of strategies contributes to the capacity of the households to deal with the disturbances. Table 14 shows the number of households engaged in the different livelihood strategies in different villages (Swallow et al. 2007). The table counts the number of income earning strategies and household livelihood strategies overall and then divides them, by the number of households, to reach the average number of strategies applied by each household. The conclusion drawn from the table is that the village with the lowest number of strategies has the highest percentage of households living below the poverty line[88] and thereby argues for the positive effects of diversification.

Strategy	**Village in the NIB (similar to Nakuru)**	**Villages in Kakola-Ombaka area**	**Villages in the Awach/Achego area**	
Beans			6	
Bicycle taxi	4	8	1	4
Casual labour	31	3	3	22
Cattle	17	29	20	39
Formal employment	4	6	11	13
Maize	15	46	33	71
Other skilled employment	14	13	14	10
Other small-scale farming	4	13	5	4
Rice	3	1	15	73
Sheep or goats	2	48	6	74
Sorghum or Millet	1	15	17	70
Sugarcane		40		
Tomatoes	2	42	2	5
Trade	28	20	12	4
Vegetables/onion	1	51	1	7
Total strategies in village	**126**	**335**	**146**	**396**
Number of households in village	74	63	52	94
Average strategies/household	**1.70**	**5.32**	**2.81**	**4.21**
Current poverty status (%)	*62*	*29*	*37*	*37*

Table 14 Strategies applied by households (Swallow et al. 2007)

However, the relationship between the number of strategies and the poverty status is not that straight forward. Put very bluntly; it is impossible to say: diversify and you will be fine.

[88] Measurement of poverty was based on local perception and measures.

It is also important to consider the areas in which the difference occurs. For example in Kakola-Ombaka the high number of households engaging in sugar cane, tomatoes and vegetables production (all three being cash crops) is mainly responsible for the higher number of strategies. Seen that way, not only the number of strategies but as well the kind of strategy is important in order to understand poverty dynamics.

The crop that brings along most quantitative risks from a household perspective is cotton, as it cannot serve on a local level, in case no market is found. Trials to establish cotton production are still on-going. In Nyando, the DDO complained that many areas were favourable for cotton production, but people grew maize, which he saw as being the reason for high poverty levels as "people are depended on things that are not viable" (PO_DDON_40M). From the farmers' point of view, the situation looks different. They are aware that maize is only for subsistence and cannot provide enough cash income; however it is still considered better than the uncertain cotton production (FTO_J65_M)[89].

Apart from the kind of crop, also the way crops are produced is important[90]. Using the importance of being able to make decisions, in order to retain manoeuvring capacity, the dangers associated with intensification depend on the knowledge about the newly installed system, as well as the capacity to deal with up-coming problems. Adams (1990) stated in this respect that central organisation of irrigation production is often seen as being useful in order to reduce risks through better control. However, it goes together with the need for increased bureaucracy, which reduces the potential for creative adaptation and openness to change, wherefore the Kenyan irrigation sites studied performed poorly (ibid: 1320). A further tricky component of a large-scale irrigation system is that it needs a concentrated effort of a group of people to work together in order to maintain it. Collapse of some parts of the irrigation system can affect huge areas of the scheme, far away from where the collapse occurred. If this is not organized locally, people depend completely on the overarching structure.

> "We depended entirely on the board to provide facilities such as pumps, ploughing and so we had to wait 10 years [after it had collapsed]. " GD_NAK

For the scheme, it is argued that while its goal was to improve livelihoods, it increased the numbers of threats that are hard to control and respond to at a local level. Furthermore, by taking over the management, the NIB directly reduced the households' possibility of taking decisions in agriculture.

[89] This way their strategies could be described as minimising quantitative risks and not maximising gains.

[90] One of the unintended consequences of large scale rice irrigation schemes is an increase of Malaria and other water borne diseases through the irrigation canals. Some villagers in Achego were even reported to have blocked the drains, due to the diseases they brought.

What is the role of the market within that? Intensification requires markets for exchange. While Basmati rice can potentially be sold at a high price, it needs more care during the growing period in order to avoid losses (birds like to eat it) and furthermore the yields in kg/ha are lower than for local varieties[91]. Therefore, if the farmers do not succeed in selling the rice to outside buyers who will not only pay for the quantity but also for the quality and taste, the farmers will decreased their own food security. According to Cohen/Atieno-Odhiambo (1989: 70) the main reason for impoverishment of the Luo from the 19th to the 20th century is that they have been exposed "to the uncertainties of the world markets" (ibid: 73). Because market failure had been experienced frequently, in 2006, the focus of most organisations working in the area was on diversification and food security (CREPP, DAO, rice farmers meeting)[92].

Apart from the world market, small-scale variations and relations to the external are of importance to understand the impact of events. In Chapter 6.1 the importance of regional exchange between the highlands and the lowlands has already been emphasised. The Kikuyu, Kisii, Luo and Kalenjin have a complex trade network up to today. This network however was disturbed by the post-election clashes of 2008. Prices increased substantially (e.g. the price of inorganic fertilizer doubled) and farmers in the high potential areas (e.g. Kisii) were not able to sell their products in the Luo area. In the LNB, transport became a nightmare as the transport system was dominated by the Kikuyu who stopped their business during the crisis. At the same time, food prices especially for fresh vegetables, were reported to have more than tripled in many parts of Nyanza (around Lake Victoria) (Awiti 2008); e.g. the price of maize increased from 20-30 KSH per tin[93] to 120-140 KSH per tin. Some local farmers capitalised upon the missing imports from the highlands to make profits. Farmers from Kakola-Ombaka for example used the sudden price increase to sell their products at higher prices at the market in Kisumu (JL_K_45M), even though this sometimes meant cycling around 20 km to town, as public transport was limited.

Through market exchanges people in Kakola-Ombaka can even profit from dry years, even though the harvest is lower than during wet years:

> "During the rains, vegetables do well since a plot that could give one sack in drought season produces two sacks, but the problem is that the market is full. You can also harvest maize to

[91] Rice as a cash crop can at least be consumed at home in case no market is found, the outcome of cotton production is even more uncertain.

[92] In order to overcome the problem of not knowing whether a market will be found, CARE Kenya introduced the contract farming, with a fixed price being agreed on between seller and buyer prior to planting. And CREPP is involved in the big noise campaign by Oxfam, trying to help people to get control over the market and demand higher prices.

[93] Tin is a local measure used (as there were famines during which relief aid was distributed in tins). 1 Tin is around 1 dm^3

> take to the market but when you are there, the market is full. But during drought whatever little you harvest has a market […]. So business booms during drought. […] In times of rains, the demand of farm produce is low. In a way that most of the people in the village suffer." GD_KAO

It could be stated that markets increase quantitative risks (the probability of experiencing loss), but functioning market can increase the diversity of available strategies and thereby help to deal better with variability and change. However as markets cannot be controlled by the small-scale producer, it has to be made sure that measures are in place to tame the potential dangers of the markets or to be able to deal with its variability before engaging in intensification and thereby increasing dependence on the market.

Discussions around intensification and calls for production for the market often go along with calls for large-scale farming. While most of the projects encountered in the field target small-scale agriculture, thereby staying within the boundaries of the prevailing mode of production, the on-going struggle with the support of large-scale irrigation schemes already points to the promotion of large-scale farming (see Spencer 2001, Ashley/Maxwell 2001, Hazell et al. 2010, Salami et al. 2010 for more details). The JICA/MoPD (2005) land-use plan sees the future of the Lower Nyando Basin in large-scale farming through a substantial restructuring of the landscape (Figure 14).

The promoters of large-scale farming argue that it could lead to higher returns.

> "Smallholder farmers must be encouraged through land sale or land rentals to leave the agricultural sector to give way to larger holdings. Larger farms can attain higher production efficiencies, cope with competition and tap the benefits of globalization." Awiti (2008)

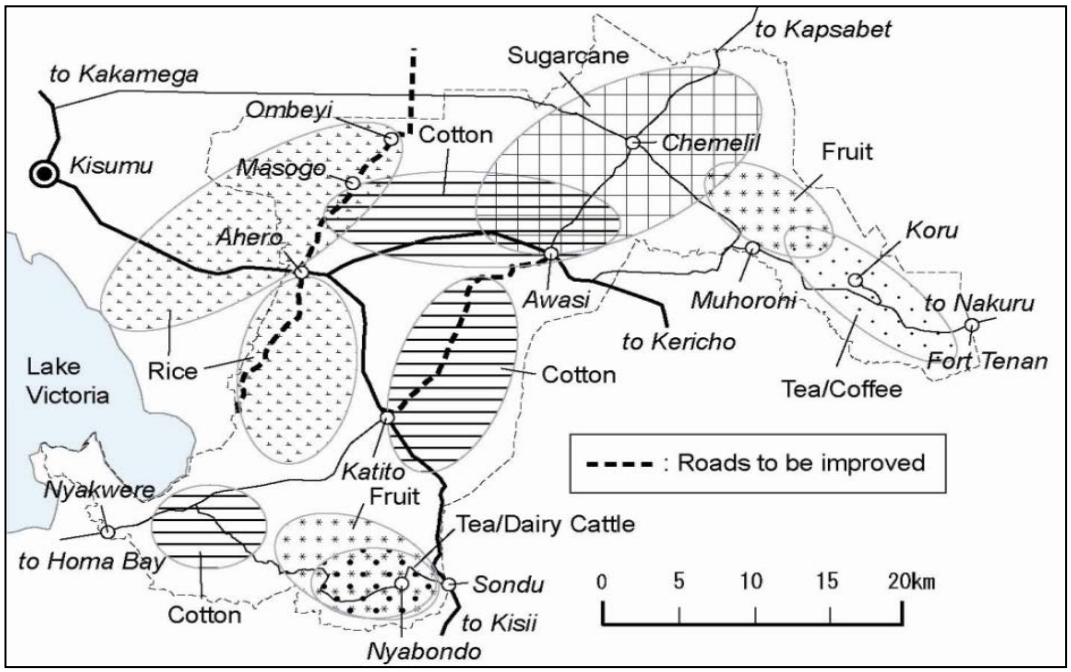

Figure 14 Land-use framework for Nyando (JICA/MoPD 2005)

However consolidation of fields also brings along problems. Traditionally, the land owned by somebody is spread over diverse areas in small parcels and it is common to have crop fields up to three kilometres apart and additional horticultural fields close to water sources where soils are good but risk of floods is higher. The spreading of fields over the area leads to a reduction of risk for farmers, as the fields are exposed to different conditions: if one field is too wet due to high rainfall or floods, another parcel lying higher might provide better conditions, and vice versa. It further promotes diversification, by allowing to plant various crops with diverse requirements. However, the subdivision into small fields renders them more difficult to use in an efficient way, and causes inconvenience to farmers who want to modernise farming technologies, e.g. through the use of tractors. One farmer I met, who had returned from the city, and was trying to get into agriculture, was complaining about the numerous small fields spread over the whole area, which made working on them time consuming (LN_AW_40M).

Another way of spreading quantitative risks is co-operation and lending out cattle within communities. Thereby poor people would be given cows as a loan for their daily usage (milking and ploughing), while the more affluent would reduce the probability of losing all cattle to diseases or theft (Butterman 1979: 64). Even today, some sort of lending out cattle among relatives is common - either on a regular basis, or during times of droughts and floods. During droughts it is common to bring cattle to the swampy areas along rivers and the lakes, which serve as a grazing refuge. In case somebody has friends or relatives in the grazing area, cattle might be kept for a longer period.

At this point it is important to be clear about the level on which intensification should be pursued and for whose benefits. From a production and marketing point of view it might make sense to define large areas suitable for a specific crop. When focusing on the household level however it would need to be made sure that new ways of insurance are available, so that households are able to deal with the new quantitative risks going along with the concentration on only one crop. Currently every farmer kind of insures himself by producing different crops in different areas, when consolidating the areas as planned, it might be necessary to spread the risks through more widely organised insurance systems. Furthermore better ways of information collection and distribution would be necessary in order to achieve the necessary flexibility in case a change of production is necessary.

Which kind of strategy to follow also, depends on the purpose of the agricultural activities: as being business oriented, or as a support of the livelihood. One aspect here is the attitude towards farming which is discussed in Chapter 6.3.

6.3 *Moves away from agriculture and their impact on society and environmental management*

"We just plant for the sake of doing. " AL_K_75M

"Some people are afraid of farming so they are just roaming everywhere out and in. Youths hate farming; they value their education much. Some are willing to do farming but they lack resources. Lack of facilities also discourages the youths." GD_NYA

While the oxen plough changed the attitude towards manual ploughing (Chap. 6.2.3); the attitude towards farming needs to be looked at from a more holistic point of view. Although they were still engaged in farming, I often heard people saying that they were just doing it for "the sake of it" (e.g. FM_VI_45M). Their mind was set for other ways of earning a living and they did not see agriculture as something that can yield enough to support a family. It was a common perception that farmers do farming as a formality and were not working as much as they could. An old farmer told me:

> "Many people regard farming as nothing, they prefer being employed in the city. Farm yield has decreased because many people are working in town; the people who are farming are not many. In olden days you could find people committed in doing farm work." P_JE_80M

The diversity of strategies applied by farmers in order to secure their livelihoods is one sign that shows that agriculture is only one part of livelihood (see as well Lay et al. (2008)). I can only agree with the impression of a manager of an NGO in the area:

> "People always have a Plan B; because of that they don't concentrate on farming" (MF_NCR_40M)

The story of a farmer in East Nyakach can be taken as an example here. He had planted his farms, but as he wanted to get some more money, he left the planted farms behind and told his wives to take care of them, while he went to look for additional employment outside. When he came back after some weeks he found that he had lost around half of his harvest, either due to birds and animals attacking, or due to a lack of weeding. Figure 15 shows the impact of crop growth depending on whether weeding is done properly or not[94].

Figure 15 Sorghum plants (left from the part of the field where weeding was done, right from the part without weeding) (Picture: own, November 2010)

[94] This example could also be described using the risk-chance dichotomy. What could be said using that dichotomy, is that the farmer traded-off a more or less secure harvest (in case of proper care) with the chances of getting more money when working somewhere else.

Labour input is an important factor for explaining yield fluctuations. Increased labour input is said to have been a major factor behind yield increase in 1999 when "people saw the need of working"(GD_NAK) and 2003 when "people were about wise" [they realised that they could achieve something, if they worked hard] (GD_NAK).

In many Luo communities people got used to finding a white-collar job in the 60s-80s and thereby getting money. This is blamed for disinterest in farming.

> "Nowadays, sons are looking for jobs: So the workload in the rural area for those that are staying behind is too much. Long time ago, there was no land lying fallow. People were stronger. Now people are moving to town. Those that are left behind can't produce enough as the workforce often is in cities." PO_AW_80F

> "Those days work was easier, people were less, but they worked. Nowadays people can't work on the farm, people are lazy, and there is a lack of implements. Now they only want to make money fast. So not every field is farmed or weeded. Those days people were few, but they could work because there was enough food. Now there is not enough food, there are no jobs. They wake up hungry, they don't work well and they don't get much." AL_K_75M

Another factor however is demotivation due to missing or limited returns[95]:

> "In olden days you could find people committed in doing farm work, but now population is high and so for you to work on a farm so as to get what is enough is hard and so people are discouraged." DO_AW_70M

> "No promises are hold [were upheld]. You have spent and spent but there are no gains. Consequently there is demoralisation of the farmers" GO_JE_30M

> "When the individual fails to find a viable livelihood with decent returns and the dignity of work, demoralization may begin to set in." Havnevik et al (2007: 61)

School education is also blamed for having alienated people from agriculture (see Chapter 6.2.2 for more details):

> "The youth nowadays is not working; they are just sitting idle doing nothing. There is no parental guide and youths are putting more effort on education than farming." RN_AW_35M

Many parents value school education highly[96]. Out of the 81 questionnaires administered 38 people indicated that they wish that their kids would be educated and find work outside agriculture. They do not see a future in agriculture and want their kids to be educated in order to find a job in town afterwards. Currently, farmers in the area are selling pieces of land, either in cases of emergency or in order to educate their kids.

[95] The uncertainty about the timing of rainfall is said to even keep some from farming (investing in the fields) at all.

[96] Even though most of the population in Nyando District (97.3%) thought it to be unlikely to secure employment after completing school (GoK 2004).

> "If you compare olden times and today; life is really tough, for people who are working and earning money it's at least for them, but for us it's tough. We are suffering. It could be better if you have some hectare fertile land, you could sell and even educate your kids." GD_JE

From a farming perspective one could say that the potential of failure is increasing with engagement in schooling, however from a household perspective it increases the chances of well-being of the household. Instead of talking about a lack of inputs being responsible for low yields in the area (see Chapter 6.2.3), it could even be said that the household's resources are invested in other areas. In case a farmer does not have to sell all his land in order to pay schools fees it can also increase the decision-making options of his kids, however if all the land is sold and all the knowledge about farming is lost because of schooling, dependence on hard to control factors (labour market) is increasing.

Havnevik et al. (2007) paint a picture of doom because of the selling of land:

> "Poor farmer households are the most vulnerable, often forfeiting or alienating their land rights as a result of sickness or death within their families and households. The most marginal rural households (both male- and female-headed) are likely to break up and disappear altogether." Havnevik et al. (2007: 34)

Whether households will break up because of the selling of land as Havnevik et al. (2007) state, and whether this actually should be seen as bad, needs to be considered carefully. The concentration of fields in fewer hands could increase the income earned per farm. The question would then rather be what happens to the landless people. Whether the Kenyan economy will be able to provide enough jobs outside agriculture remains to be seen.

While many on-going projects and policy papers regard small-scale agriculture as being the main concern of households engaged in farming, it is argued here that households in the Nyando Basin are not engaged in full-time farming. Some people refer to "rice farming as a hobby" (farmer in Achego), or call themselves laymen farmers. Others are fed up with small-scale agriculture or consider their education to be more important than farming; some are afraid to invest as they have been discouraged by variable or declining yields; some do not have enough land or enough labour force, or are missing other resources (GD_JE). It therefore can be doubted that it will be easy to increase production in the current setting.

Rigg (2006) states:

> "Lives and livelihoods in the Rural South are becoming increasingly divorced from farming and, therefore, from the land. Patterns and associations of wealth and poverty have become more diffuse and diverse as non-farm opportunities have expanded and heightened levels of mobility have led to the delocalization of livelihoods. This, in turn, has had ramifications for the production and reproduction of poverty in the countryside, which is becoming progressively de-linked from agricultural resources." Rigg (2006: 180)

While the World Development Report 2008 denotes African small-holders as subsistence producers, my observations show a process of depeasantisation in the LNB including the following aspects (cf. Havnevik et al. 2007: 43-50): (a) a search for non-agricultural activities and income, (b) a search for monetary income, (c) migration to the cities while at the same time (e) retaining a desire to achieve household basic staple food self-sufficiency as much as possible (see the excursus below on rural-urban linkages).

Very generally it can be stated that lack of investment is currently negatively affecting agricultural output. Whether, however, efforts should go to increasing agricultural yields on small farms or consolidation of farm land and the creation of off-farm income generating opportunities is an open question and depends on the context.

Excursus: Rural-Urban Migration

Rural-urban migration and links have a strong influence on the area. This link can for example be seen by the big movement of people towards the rural areas during festival season and times of high labour requirement (weeding, harvesting) in the fields (GM_CARE_35M). Working in towns does not mean that people give up the stakes they have in land[97]. Many plan to retire in their rural homes. Sending remittances to the rural areas or investing there is a common practice (e.g. building a house). According to MW_VI_40M around 60% of the households get remittances. AA_R_40M supports the view, that the remittances are keeping many of the farmers alive even though they do not really get something good out of their farms.

People in the cities often also depend on the rural areas as means of security. For instance, return to the rural area was especially strong after the clashes in 2008. Great parts of the population fled from the big cities that were the centre of violence. Having a home in the rural areas was a necessary asset for their security. After the clashes many people stayed for long in the rural areas. This reflux of people lead to some changes, which can, among other factors, be observed by the numerous new houses and small restaurants which have been built along the streets in Lower Nyando Basin.

[97] Even researchers and politicians in official meetings remind themselves that at the end of their working lives they will return back to their rural homes (KARI-WKIEMP meeting).

6.4 *Traditions and their impact on resource management and changes in farming*

> "You are brought up, so you cannot shake it all off." EO_J_30F
>
> "Now, we are modern people […] we are so involved in modern live, forget the past, we are in modernity" (JO_F_X)
>
> "Never look at culture as a negative thing. Look at it as challenge." DP_RP_XM

Chapter 6.1 adumbrated the development towards more agricultural based livelihoods at the beginning of the 20th century and Chapter 6.3 argued that some depeasantisation is on-going. And indeed there are two pictures of a changing society locally: one is about a society dreaming about finding work in town, no longer wanting to work on farms, and explaining problems in agriculture that way, and the other is to claim that so far just nobody realised that "agriculture is everything" (brother of FWO_AW_40M)[98].

> "The problem with parts of Nyanza is that farming is not viewed as a commercial undertaking, but merely for subsistence and even then it is done traditionally." Ohito (2006: n.p., quoting the Provincial Commissioner)

Some Luo still refer to themselves as "shepherds" (FWO_AW_40M) or argue that agriculture is "a cultural activity that is not planned" (MW_VI_40M), in order to explain difficulties. In both cases there is reference to some sort of tradition, which is shaping the way that resources are used. The aim of this chapter is to reflect critically on the notion of 'tradition', its' use in the LNB and how it is related to changes. The chapter looks at some of the most commonly discussed traditions with regard to resource management and thereby their role for environmental management, the purpose they might serve and how they relate to scientific explanations. The notion of tradition is thereby scrutinized as well.

The Luo see themselves as still have a strong traditional culture (MGU_NCA_40M). During the regional development planning workshop in 2006 it was stated that the role of culture had been underplayed (LO_R_45F). As a reason for not talking openly about tradition, it was said that people feel ashamed and think they are primitive. Tradition is hardly ever discussed as something positive in the region. The people themselves often say that "culture makes [them] fixed a bit" (JO_DAO_42M). Traditions such as that for many agricultural

[98] A project manager told me, concerning the attitude of the youth: "It is very interesting; they see that CREPP is managed by young people, this also makes young people getting interested" (Interview CREPP, May 2006). And, when there are good opportunities identified, one will find young people working on the fields enthusiastically. On a field visit to the wetlands on a Sunday, I met people that just came back from farming, in an area they called "Canaan - the land that Jesus wanted to bring them".

activities sexual intercourse beforehand is necessary (R_K_40M), or the fact that cows are seen as a sign of wealth and therefore are kept purely for prestige, are blamed for increasing poverty. Traditions are often regarded as being inflexible and are therefore brought forward as a reason for maladapted or even irrational behaviour and backwardness in the LNB.

The most prominent tradition in agriculture requires the most senior person to start ploughing, farming, weeding and harvesting. One reason behind that was probably hierarchy within communities, but it might also aim at allowing old people to transmit their knowledge. This custom became a problem, as soon as labour migration to the bigger and far away towns (Nairobi, Mombassa) started and it also causes problems when the senior persons are sick or otherwise not able to attend to their fields (IA_KR_45M). However, change of this tradition is on-going as has been discussed in the chapter on rainfall variability.

There are several beliefs concerning trees. For example it is said that if a croton tree is planted too close to your house, the man becomes a cabbage or dies. This myth can also be explained by the fact that roots often cause houses to collapse. In Busia there is the myth that a person is only allowed to cut the Mvuti tree when (s)he has at least five goats and beer to celebrate, before cutting. While this tradition actually can protect trees (Q_C_35M); it is however in many cases no longer followed.

Funerals are another issue, which shows that people are changing and adapting. While funerals used to take several days and farm work was not allowed during that time, the increasing number of funerals also changed the way they are conducted. People do farm during the day of funeral, and funerals do not last as long as previously. Nevertheless a lot of resources are spent on funerals, which was considered to be irrational by some outsiders. However, it might serve a necessary social function for those who have to deal with the loss (as e.g. the ‘Totenschmaus’ in Germany).

Based, on this sketch of some traditions, I want to reflect on the potential role of traditions in natural resource management in the LNB. The question is whether traditions, that seem to be based on beliefs rather than on science, aid or impede successful management of resources. Often traditional is equated with irrational. However, similar to my argument regarding the influence of trees on rainfall, what I want to do here, is to differentiate irrationality with regard to the underlying explanation, or with regard to the outcome (with regard to outcome irrationality would point at actions that clearly cannot bring the desired result). It is argued here that traditions and beliefs often can be seen as being based on experience and long-term observation of behaviour, which are then framed in memorable presentations (see e.g. the discussion about the rain makers) and thereby might even serve their purpose in guiding action much better than scientific explanations. For example,

whether the collapse of the house is explained by referring to the roots that caused the problem or by stating that trees planted close to the house call something bad to happen often not really matter with regard to the impact they have on the actions taken. However, the latter explanation might seem to be rather irrational at a first look. The attachment to land of people that are working in towns, while often described as blindly following tradition, can for example as well be seen as response to frequent job loss and the need to have some security for retirement. Before blaming traditions for being backward, their deeper meaning and impact should be scrutinized.

Ochola concludes:

> "Some of the cultural practices were meant for just courses to protect vulnerable members of the society like prohibiting women from constructing houses, planting, or cutting trees, determining boundaries and fencing as well as acquisition and sale of livestock. Other taboos were meant to enhance love while some merely protected parochial interest of a section of the society like male elders. Such taboos include those affecting the type of food and cut of animal to be eaten by men, women and children. The order of land management was designed to create love, respect and harmony in polygamous families and to ensure greatest food reserve in elder wives' stores as they entertained most visitors to the home." Ochola (2000:54)

As traditions have some reference to the past an interesting question is, whether they are still applicable in the current setting. It is interesting to elaborate, when traditions are questioned and how and when they are changed. Even though tradition is often blamed for problems in the area, there are many signs that indicate that traditions are changing in the LNB (see the examples above). There is a vibrant discussion about the old way of doing things and new ideas are welcomed:

> "The culture of the Luo, like other communities, is changing due to the forces of education, religion and modernization." Ochola (2000: 54)

> "This is our culture; the young are not following it… But why should they follow it? It's a new generation; they don't have to follow the old." MO_M_50F

> "People need to change. There is change. People are talking more openly." NA_VI_25M

> "The tradition was poor! Now there is a delegation of duties between men and women." JM_70_M

At the same time people refer to themselves as being hybrid, in-between, or floating[99]:

> "Out there we can be very modern people, but get me in the village, we are traditionalists." JO_DAO_42M

[99] With regard to agriculture somebody told me that people will follow traditions when it comes to subsistence farming (maize), whereas for cash crops people do not follow culture as they will not eat them.

> "We pass the tradition by in our normal life. But if you have a problem, everybody speaks of Chira [a curse]." DP_RP_XM

Voices could be heard expressing the expectation that "tradition will go away with [many] young people not being willing to state which tribe they come from or to talk in their mother tongue" (FW_AN_30M). The overall attitude can probably be summarised with: "some traditions we will follows, others not" (MO_M_50F).

While I have argued above that traditions are changing, I would nevertheless state, that one of the specifics of traditional ways of doing things is that they are often hard to challenge and that referring to something as traditional (be it a recent innovation or not), can serve as a knock-out argument ending any discussion.

Therefore instead of trying to brand-mark tradition as good or bad, I suggest trying to understand why something is called traditional. An interesting point here is that tradition, as well as a loss of tradition are used for explaining poverty. General statements about the role of tradition should be treated with care. In the Annex 11.2 the example of the famous snake Omieri shows that reference to something as a tradition or a cultural symbol can be used to make political claims.

6.5 *Society-nature relations – intermediary discussion*

As a final thought on the multitude of factors influencing agriculture I will discuss (a) the possibility of identifying key factors and (b) the contribution of the concepts of risk and resilience for reflecting on them.

6.5.1 Key factors and case studies

It has been exemplified, that numerous factors are influencing agricultural performance. It further was shown, that strategies of households with regard to farming need to be explained within the context of the whole livelihoods of households. As poverty and agriculture are closely linked in the Nyando Basin, the following statement can serve as highlighting the multitude of factors:

> "The major causes of poverty in Nyando District include: poor agricultural technologies, lack of proper storage facilities, erratic and unreliable rainfall, poor and inaccessible road network, frequent floods, problems with the sugar, rice, cotton and fish industries, lack of title deeds, poor water and sanitation systems, impact of HIV/AIDS; low accessibility to health services, among others." Nyando DDP (2002:22)

Apart from the issues listed, it will be influenced by population growth[100], market relations, labour constraint, political conditions, attitudes of people, knowledge and many more. They all have a role to play and mix differently in different settings. The question is whether it makes sense to start looking for key factors within those factors. Some of the examples above already showed how difficult it is to talk about key factors[101]. In the previous chapters the oxen plough example demonstrated that while often the blame for bad timing is put on the rainfall being unpredictable, socio-economic issues can also be seen as leading to bad timing of ploughing and planting. This becomes even more complicated when considering that different resources can be converted into other resources. For example, social capital can help in case of lack of financial capital; and missing information can be buffered by inputs (e.g. if there is not enough information about rainfall, investing in an irrigation system could be an opportunity) and vice versa. This further relates to the difficulty to differentiate cause and effect (see as well Place et al. 2005), especially when including poverty in the equation. Circle arguments like the following are common: Oluko-Odingo (2009: 319) states that socio-economic factors (poverty) are more decisive factors in food security than is climate variability; only to present climate as leading to poverty later on. Poverty can be seen as the reason for, as well as the outcome of low agricultural yields. The sketch below shows some relations from a poverty point of view (Figure 16), but equally other points could be taken as starting points.

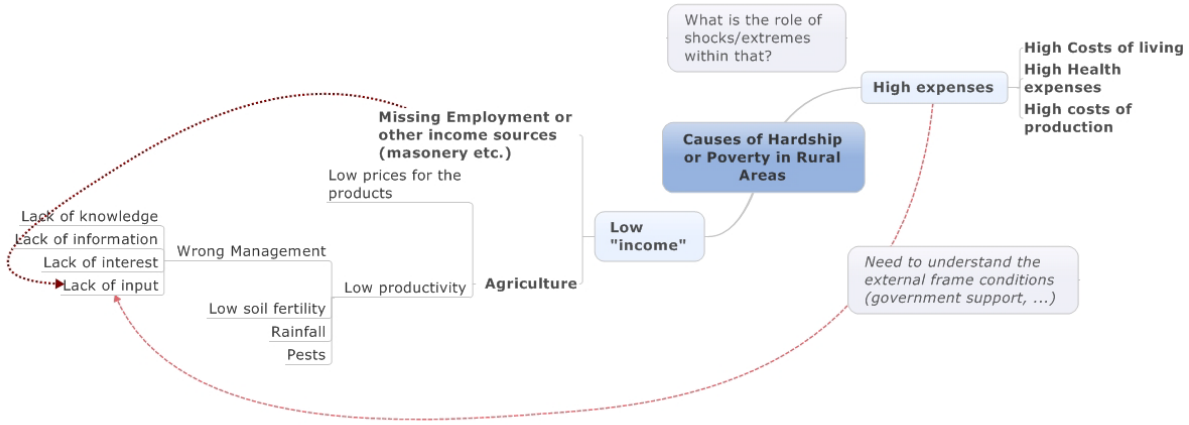

Figure 16 Mindmap on causes of hardship or poverty in rural areas (own sketch)

I doubt that it makes sense to approach an analysis of SNR by trying to identify general key factors or main entry points. At least, I want to argue that this is not an academically inter-

[100] In East Africa agricultural production trebled between 1961 and 2007, however due to population growth it fell by 21% per capita over the same period (FAOSTAT 2010; http://faostat.fao.org) (last accessed in March 2013).

[101] For example, the DDP (2002), Jensen (2009), GoK (2004), Oluko-Odingo (2009) - all identify different key factors.

esting question, as its answer depends too much on the context and the aim of the analysis.

> "Just as there is no cure-all that works in all settings, there is no ideal entry point for carrying out rigorous, useful research on linked SESs. The entry point depends on the question of major interest to the researcher, user, or policy maker." Ostrom (2007: 15186)

The most important factors for a specific dynamic might be the circumstances as they vary in space and time.

> "It was the layering of history, geography, globalized macro economy, policy, culture and population concentrated on an inherently vulnerable landscape, which combined to produce some of the most extreme poverty and environmental conditions within the entire Nile River basin." Jensen (2009: 146)

Simple predictive models of SESs are unlikely, given the multitude of variables that are interacting (see e.g. Ostrom 2007). Therefore, I argue that efforts to arrive at a holistic functional understanding and an identification of general key factors can often rather be seen as political or programmatic statements and a fully objective representation is not possible. What seems to be important is to accept different perspectives as complementary and to make the own position and assumptions as clear as possible. Interdisciplinary science should allow for communication between different views, offer reflection and scrutinise dominant representations, in order to pay attention to the way problems are framed (e.g. Demeritt 2009 or O'Sullivan 2004: 291). A goal could be to uncover blind spots through a general assessment, while not abandoning the specialized fragmented views which are as well necessary (Carpenter et al. 2009).

While it might seem to be disappointing that no simple answer can be given, it may also be seen as an opportunity for some reflections on the role of case studies. A discussion at the end of an interdisciplinary workshop at the ETH Zürich in 2009 went as follows: A scientist (called in the following Scientist 1) had been criticised after his theory based presentation, that his theory could not be applied in a different cultural setting. He countered that this criticism would not make sense, as he could not have asked those that presented a specific case study, why they used a certain theory to explain what is going on:

> Scientist 1: "I wonder how you will compare the different case studies."
>
> Other scientists: "We don't want to compare them in the sense of categorizing them and drawing some general solutions."
>
> Scientist 1: "I think the way the workshop was set, it didn't bring any meaningful scientific exchange or intellectual advance. "

> Other scientists: "This discussion could go on for hours; everybody could start reasoning from his discipline. But we should rather concentrate on what we had learned about the subject."
>
> Other scientists: "We are not trying to find the big stories."
>
> Scientist 1: "I could also write novels."

Case studies can on the one hand serve the purpose of highlighting the specific characteristics of a setting; on the other hand they can be used to find regularities which can later be put down in general theoretical statements. Interdisciplinary case studies often end up presenting an accumulation of perspectives from different disciplines, describing all different factors that are contributing to a specific setting (social, economic, natural capital and so on, e.g. livelihood analysis) that are then visualised in flow charts that connect the physical, the social and the ecological in numerous ways. However, this can end up with describing everything and learning little.

While it is necessary to accumulate different perspectives, I want to argue, that we should arrive at a more structured way of doing that in order to allow for easier comparison. At the same time, case studies might not necessarily have to be done by scientists. The role of the scientist might be much more in the area of systematising to compare the case studies. Science should help to organize the existing knowledge and find ways of making knowledge accessible in a meaningful way. Better comparability could be achieved by agreeing on a framework for conducting case studies.

> "Without a common framework to organize findings, isolated knowledge does not cumulate." Ostrom (2009: 419).

This framework should give an overview of possible perspectives on SNR. While everybody will draw connections differently and will scrutinize different parts of the picture, researchers could then at least clearly state, which part of the framework they concentrated on.

6.5.2 Specifying risk and resilience to describe the society-nature relations

Risk points to the possibility of gaining knowledge about the future, not only quantitatively, but also qualitatively by being aware of alternatives and feeling able to take decisions. In the following some examples are summarised, demonstrating how changes impacted on risks and resilience in the LNB.

Rainfall prediction changed from the rain-maker to the KMD. With that, the accuracy of predictions might improve in the future, however currently missing understanding of the predictions or wrong forecasts rather increased the possibility of taking decisions based on wrong understanding. Furthermore, by giving the KMD the 'mandate' to predict the rainfall and thereby the power to decide on best starting days for planting it is possible to say that what used to be a risk for the community has been transformed into a threat. The depend-

ence on decisions taken outside might be aggravated by changes in the society, with experienced farmers either disappearing or losing power. Likewise, through the introduction of new seeds, the seed companies took over the knowledge concerning planting time and necessary growing conditions, the dependence on external factors increased. While the introduction of new seeds could be seen as potentially reducing quantitative risks, as better choices of crops are available in theory, it increases the uncertainty as farmers do not have enough information to make confident decisions. Furthermore, while seeds might decrease the probability of a loss of harvest, it increases the financial loss in case no harvest can be achieved, as the seeds need to be purchased. Additionally, as the new hybrid seeds cannot be traded for through barter trade, they make an engagement in a market economy necessary, with all its consequences. Another example is the introduction of new technologies, as e.g. the rice scheme, which confronted individuals with the new danger of the scheme breaking down. This danger can again not be controlled on an individual level.

In sum, when using Luhmann's definition of risk, it can be stated that, decision-making options (alternatives) have in theory increased with regard to potentially available strategies, the felt decision-making power has decreased as either knowledge or resources are missing. In many cases the decision-making power has shifted from within the community to external actors. While the probability that a negative event happens might decrease with those changes this is only a theoretical construct, as the real impact of the changes depends on the knowledge that affected societies have about them. In other words: households' capacity to respond to stresses and adapt to changes is governed by its flexibility to choose from and modify different livelihood options (Thornton et al. 2007). Future changes that are introduced would have to try to keep a certain level of controllability on a local level and the possibility for people to make informed decisions.

Thinking about risk in this case study basically draw attention to decision-making options and real or felt decision-making power. Thinking about resilience basically focused on the decision-making context in the long-term by looking at changes in knowledge, buffers and diversity. Analysing the changes through a resilience lense, it is possible to state: (a) new seeds and technologies increased the diversity of available strategies, (b) deforestation, land degradation and poverty reduced the buffer capacity of the system and (c) changes made new knowledge necessary which not always is available on a local level.

When talking about diversity it is necessary to analyse the currently used strategies, but as well to get a feeling of how fast a shift to other strategies would be possible. Knowledge and buffers will influence how fast changes can be made. As knowledge has limits, buffers are of extreme importance. Buffers in SES can refer to all kinds of resources. In the LNB land degradation reduces the ecological buffer with regard to climate variability (Verchot et

al. 2008: 22), as water runoff takes place faster on bare soils and the erosion potential is increased. Social capital as well as household's tradable material capital seem to have decreased as well, thereby decreasing social buffers. For example, the death of one ox might already decrease the number of oxen to such an extent that ploughing with them would no longer be possible. And according to Nyakundi et al. (2010: 359) only one per cent of the households actually put seeds aside in order to be prepared for emergency replanting after floods. Therefore often one single unexpected event can change the whole dynamics. With regard willingness to invest in change the following can be said: While households often seemed to be unwilling to make investments into agriculture and to change the way things are done, they are willing to invest in schooling and off-farm labour. Those investments often reduce the buffers available for agriculture and the capacity to deal with problems in agriculture, while potentially increasing the household's flexibility by being able to choose from different livelihood strategies or by providing financial buffers to deal with low yields. In that sense, households might become more resilient towards the impact of a drought, whereas the agricultural output will probably suffer more from droughts.

When trying to assess whether resilience decreased or increased in the study area the need to be more precise becomes obvious as has been discussed in Chapter 3.2.2. For example, with regard to the brake down of the rice irrigation scheme one could say: The irrigation system was not resilient to the shock brought about by the floods and the siltation, however the households might be considered as having been resilient because they managed to survive. It could then be discussed whether it is enough to survive. The high levels of alcohol consumption and HIV/AIDS could be interpreted as a sign of loss of resilience. As resilience is a very general term, in order to use it for evaluation of performance, it would be necessary to clearly state which resilience is referred to (e.g. the households, the individuals, or the rice-schemes) and whether the resilience refers to structures or functions. In many cases it would even make sense to stick to more concrete terms, such as for example decrease in household wealth, change in livelihood strategies and so on.

7 The role of floods in the lower river Nyando basin

Whereas a large amount of literature about coping with droughts is available for pastoral nomadism in arid and semi-arid areas of sub-Saharan Africa, less attention has been given to disaster risk assessments in areas of higher agricultural potential. This can probably be attributed to the fact that the famines occurring in dry lands are more obvious and disturbing (leading to death) than in higher potential areas. For Kenya, most of the publications on natural disasters are on coping with droughts, and fewer publications look at the equally frequently occurring floods (google scholar[102] gave 180 hits for "flood management + Kenya", while it gave 498 hits for "drought management + Kenya" in the period 1950-2006[103]). Strategies to deal with rainfall variability are, however, also important in wetter areas. This chapter (a) gives a brief description of the floods and their (direct as well as indirect) consequences, (b) analyses flood disaster management and coping with floods and (c) discusses whether floods should be seen as normal events or as disaster in the LNB.

7.1 *Description of the floods: area, timing and consequences*

> "With the current rains in most parts of the country, floods are causing havoc as happens every year. " East African Standard (2006)

According to the database of the Centre for Research on the Epidemiology of Disasters (CRED_EM_DAT), the predominant disasters in Kenya are (a) epidemics and diseases, (b) floods and (c) droughts. Droughts and epidemics affect the highest number of people per event (around 23 000 000 people by the 1999 drought in contrast to only 900 000 by the floods of 1997), however floods kill more people per event and are spearheading the economic damage (see Table 15).

[102] in June 2012

[103] However, for the period 2007 to 2013 the number of new publications was more or less equal, with 555 publications for drought management and 548 for flood management (in January 2013).

		# of Events	Killed	Total Affected	Damage (1000 US$)
Drought		11	196	39150000	1500
	average per event		**18**	**3559091**	**136**
Epidemic		4	1273	22538	-
	average per event		**318**	**5635**	**-**
Parasitic and Bacterial Infectious Diseases		20	2937	6854034	-
	average per event		**147**	**342701**	**-**
Flood (unspecified)		7	228	961200	21850
	average per event		**33**	**137314**	**3121**
Flash flood		6	100	48000	500
	average per event		**17**	**8000**	**83**
General river flood		23	554	1161897	38
	average per event		**24**	**50517**	**2**

Table 15 Disasters in Kenya between 1900 and 2010 (wwwEMDAT)

Nyando District is a highly flood prone district of Nyanza province, as it is situated in the lowland between the Nandi Hills to the north, Belgut Hills to the North East, Kericho Hills to the east and Nyabondo plateau in the south, which leads to large amounts of water accumulating downstream. Flood patterns depend to a great extent on the rainfall in these surrounding hills. Floods occur mainly when the major rivers overflow their banks or locally when drainage channels or rice canals become clogged. The two major rivers along which floods occur in the Nyando District are Nyando (draining from the Nandi Hills) and Awach. Other rivers along which flooding can occur include Sondu-Miriu and its tributaries originating from Kisii Highlands, as well as the Ombeyi and Asawo Rivers. Nyando River is normally about 14 metres wide in the lowlands but increases to 200 metres during floods. Flooding can occur at all times of the year, but does so mainly around April and October. Floods are a frequent and recurring phenomenon (for a map of the flooded area see Figure 4, p. 49) and people and organisations in the LNB expect them every year (C_K_40M).

> "Flooding occurs every year in the region that stretches from the eastern banks of Lake Victoria to the 2,000 m-high escarpment of the Nandi Hills. Properties and livelihoods are drowned, and deadly waterborne diseases such as malaria, bilharzia, cholera, dysentery and typhoid are spread." IRIN (2005)

According to Odhiambo/Ochieng' (2005) Nyando District has been associated with devastating floods since 1948. The floods in 1962/63 (Uhuru [Freedom] Rainfall Floods (after independence)) and the 1997/98 (El Nino floods) can be seen as the most devastating (Omondi 2004).

Flood damage in the Kano Plains is mainly measured by displacement or by damage done to crops[104]. Around 5000 people per year are affected by floods and the overall damage is estimated to be around 50 million Ksh per year (Otiende 2009, in Nyakundi et al. 2010: 347 and 350).

For 2003 the situation in Western Kenya was described as follows:

> "In flood affected western Kenya, field reports attributed to Government, United Nations and Non-Governmental Organization agencies estimate that 53,000 people have been affected by the floods in Nyando, Kisumu, Rachuonyo, Migori and Busia districts, over 34,000 people are displaced, 73 schools are inaccessible and over 10,000 hectares of land are submerged. The current situation is reportedly the worst since 1997. The Government authorities alongside, UNICEF, are currently coordinating and providing relief supplies to the affected population." FEWS-NET/USGS (2003)

Apart from displacement, the loss of human life and livestock is a major concern. While mostly only poultry drown in the floods, other long-term losses of livestock take place mainly due to diseases (such as foot rust, amoebiosis and anthrax). Human deaths occur; mostly when people try to cross flooded bridges or to save belongings or livestock. Human diseases due to outbreaks of malaria and unhygienic water are another major concern to people. A deficient sanitation system can be seen as one of the major reasons for that. In many areas residents depend on shallow wells, which are contaminated during floods.

As the Kano Plains are flat in many areas the water comes at low velocity. It nevertheless has destructive potential on roads, schools, bridges, electricity and other infrastructure. Houses are swept away (KRCS 2007) or they collapse, especially when they are made of mud. Around 89% of all houses in the Kano Plains have mud walls (Nyakundi et al. 2010: 354). For a detailed assessment of the spatial distribution of physical vulnerability (homesteads, infrastructure, schools and livestock) see the study by Ochola (2009: 133).

Bridges often are focal points of flooding, as they become clogged by the material carried along in the flood water (see Figure 17). Therefore they are hotspots of accidents and the vulnerable point when it comes to transport during floods. During the 2006 floods the Ahero-Katito road (the main road connecting Kisumu and Kisii) was blocked for a period of three weeks as the Awach Bridge was destroyed and traffic had to be re-routed to the Awasi-Katito road (around 1-2 hours longer). Other roads, too, were completely destroyed (KRCS 2007).

[104] As outstanding losses, the loss of tomatoes worth 23 thousand Kenyan shilling are mentioned by the Red Cross, or the case of Mama Ongudi (Apondo/ Magina), who lost 10 bags (900kg) of maize to floodwater destruction.

Because of the black cotton soils (clay) in the Kano Plains, water infiltration is slow, which leads to long periods of water stagnation and therefore disease development. This has as well an impact on crop growth and food availability. If water remains on the surface for too long, crops that have been destroyed by the floods cannot be replanted.

Figure 17 Bridge over the Awach on the Ahero-Katito road (Picture: own, April 2006)

The effects of the floods on human beings, as well as on the agro-ecosystem, depend on factors such as: time of occurrence (day/night, plant development), quality of the flood water (hygiene, fishing, soil fertility) and duration of the floods (houses, plants).

Apart from direct negative consequences, there are also indirect negative consequences of floods that need to be kept in mind. With transport becoming difficult during flood periods there is also a shortage of food supplies, especially of fruits and vegetables. Prices for these commodities often shoot up during floods. Property destruction has long-term effects on the purchasing power of the communities (material effects), as well as on its willingness to invest (psychological effect). Furthermore, river bank erosion can eventually threaten other infrastructure, closing of schools leads to a significant loss of school hours[105], river meandering leads to frequent land conflicts[106], burial services are becoming difficult during floods and roaming hippos and snakes pose another threat to life or health (see as well Ochola 2009: 153).

[105] While the closure of schools is mentioned in the newspapers as one of the key issues of concern, it is hardly mentioned by the local people themselves.

[106] The Nyando normally serves as boundary between land parcels.

7.2 *Disaster management – actors and action*

There are several ways to deal with and manage floods. A number of activities have been conducted in the LNB. The actors involved and the measures taken will be presented below.

7.2.1 Actors, structures, institutions

As a consequence of the devastating effects of El Niño in 1997-98, when Kenya experienced extremely intense rainfalls with 1.5 million people affected by flood, the Government of Kenya established a National Disaster Operation Centre (NDOC) in the office of the president (Few et al. 2006) and District Disaster Management Committees (DDMCs) on a district level. They are both responsible for the coordination of activities. Furthermore, the National Platform on Disaster Risk Reduction was launched in August 2004 to bring actors in disaster risk management together and to promote cooperation in disaster reduction and integration of disaster risk reduction into national policy. In the late 1990s the government also started to formulate a National Policy on Disaster Management dealing with the need to coordinate disaster management efforts and integrate disaster risk reduction into the national development process (Few et al. 2006: 14 and Mutua 2003). However, this policy is still in a draft version according to staff from the NDOC:

> "NDOC was formed in 1998, after the 1997 El Niño rains, to monitor and coordinate the response to disasters nationally. Its operations have, however, been hampered by the absence of the policy. […] The policy would also clearly spell out roles and enable better resource mobilization." IRIN (2012)

In line with international developments (as emphasised during the IDNDR), it can be stated that the existing structures in Kenya in theory seem to allow to deal with floods holistically and not only to focus on flood response. However, in the East African Standard (EAS) (one of the most important newspapers in Kenya) it was stated that instead of having a long-term approach, government response would still be focused on dishing out goodies to victims (Ithula 2006). The NDOC only meets during times of emergency[107] and while in theory serving as the main coordination and response centre, it lacks facilities, such as a communication system to reach the whole country. Given that, the newspapers are often faster in collecting information on floods than the centre itself.

> "Long after the media had started reporting deaths as a result of floods in Budalangi, an assessment report prepared by the centre and seen by the Nation did not capture these events." Nzioka (2006)

[107] The NDOC is also only allowed to operate after the president has declared an emergency (Few et al. 2006)

In Nyando district there are several local actors in disaster management. Among the most important are the DDMC, the Kenyan Red Cross Society (KRCS), VIRED, local Community Flood Committees, the media and the farmers. The DDMC consists of the district commissioner, the officers from the different sectors of the district from agriculture to health, the divisional officers and various NGOs. However, similar to the NDOC, its impact has been limited, because of being legally and financially ill equipped. The DDMC does not have a legal framework yet, so that it often lacks the capacity and capability to handle disasters (Ithula 2006). Further, during the meeting in 2005 concerns were raised that the DDMC, similar to the NDOC, only meets when emergencies occur.

> "We should meet all year round and not only when disasters loom." DDMC (2005)

Given that, its actions can basically only be reactive, and hardly ever proactive. The Nyando Branch of the KRCS was formed in late 1999 and officially inaugurated in 2003. It has established itself as the lead agency in the area of disaster management in Nyando District[108] and is currently the most active body in emergency preparation and response. It acts as the secretary of the DDMC. The KRCS has provided training to local communities on disaster management (including first aid and hygiene practices). They have volunteers throughout the whole of Nyando District, in order to respond fast and efficiently to floods. Their focus has been on community capacity building and local early warning systems. A positive outcome of the work of the KRCS is that the local population has knowledge about the possibilities available to them during disasters and whom they can call upon for help. They are aware of the disaster management structures and also the bureaucratisation of disaster handling has been established, even down to an awareness of the forms needed to report damage from disasters (C_K_40M). On the level of locations, disaster committees exist that can inform the KRCS and assess the situation on the ground. However, communication during floods is still criticised for being too slow and not accurate enough (Ochola 2009: 67). Flood management lessons have also been included in the school curriculum by teachers that took part in teacher training workshops in disaster prevention and flood management, which had been sponsored by JICA (Telewa 2011).

[108] On a national level, the KRCS put up a disaster management training centre in 2006. The facility is supposed to strengthen cooperation between states on disaster responsiveness and management while providing logistical support for countries hit by disasters in the region.

7.2.2 Flood management measures

There have been numerous studies and approaches to flood management in the Nyando Basin. First base line studies had already been undertaken in the 1970s by the Lake Basin Development Authority. The most prominent study on flood management is the one from ITAL Consult/MoWD (1983). The study focussed on flood protection and drainage of the rivers, the construction of channels and bridges. The maps produced at that time are still used nowadays (e.g. for dyke construction), even though I was told that it would not be longer accurate (DK_MoW_40M). Recently a number of new studies were conducted. These are (among others): a study by the drought monitoring Centre in Nairobi and UNEP (DMCN/UNEP 2004), the APFM et al. study (2004) (associated Programme for Flood Management), the study by Nyakundi et al. (2006) on community perception or the study by Ochola (2009). A major study took place from 2006 to 2008 by the Japanese International Cooperation Agency (JICA) on integrated water management on a community level.

All these studies focused (with changing emphasise) on structural as well as non-structural measures; on prevention as well as coping (see Table 16 for a summary of suggested measures).

	Structural	Non-structural
Prevention of the floods and of being affected	• Dykes and water retention reservoirs • River scooping and drainage channels	• Weather forecast and early warning • Flood resistant crops, change of planting time
Coping	• Reclamation of destroyed and degraded areas	• Replanting • Evacuation and relief

Table 16 Suggested flood mitigation measures (adapted from studies mentioned above and DMCN/UNEP 2004)

While at the beginning the focus was on technical engineering structures in order to achieve flood control, the focus in the latest reports shifted to non-structural and integrated approaches (WMO 2009).

The JICA initiative is an example of an integrated approach. As one of the most recent initiatives in disaster risk management in the Nyando Basin (from February 2006 to July 2008), it has focused on the following measures (JICA 2008):

1. Organization of the Nyando River Forum to assist the government to take flood control measures in the Nyando River Basin. The forum is composed of government agencies, academic institutions, NGOs, private companies and community associations.
2. Incorporation of flood control measures into community development plans in 5 model villages. Activities undertaken: promotion of the use of churches and nurseries as

evacuation centres, securing evacuation routes, conduction of evacuation drills and awareness programmes and training on building small dykes with sandbags.

3. Preparation of the master plan for integrated watershed management in the Nyando River Basin.

While the focus of the international community shifted to organisational and non-structural measures, on a local level the need for large-scale structural measures, especially the construction of dams upstream and large-scale desilting were frequently mentioned. Below some of the applied measures will be discussed in more detail.

7.2.2.1 Preventing floods – structural measures

How to deal with floods is always a contentious issue; options range from trying to stop them altogether (taming of rivers through dams and dykes) to moving to areas that are not affected by the floods and thereby abandoning the area to the flood water.

In Kenya, structural flood control is the responsibility of the Ministry of Water (since 1983), which is therefore responsible for the construction of dykes. Digging of canals, desilting of rivers and construction of dykes are the main activities. Dyke construction started in the colonial era but is not yet finished. There are constant complaints about misuse of money, or limited funds.

> "To be sure, last year, the Government embarked on a project to avert the anguish. It forked out Sh47 million for digging canals and clearing tonnes of silt from streams and rivers. But the Government shortly thereafter, ran out of steam. Silt has once again fill up most canals. Despite some Sh70 million being allocated to the project this year, there is little to show for it on the ground, except for a little dyke on the banks of River Nyando, on the Ahero-Kericho highway." (Ochieng'/Odhiambo 2005: n.p.)

While many want dams upstream, the dykes are controversial. On a community level, the people's scepticism towards the dyke and lack of proper regulation, which would allow the communities to manage the dykes themselves are further impeding dyke construction and maintenance. Mistrust is prevalent and people still remember that the construction of the dyke started in a bad manner (SO_M_35M):

> "When they came to build they gave us notice, but we didn't take it seriously, there had been so many notices before and nothing had happened afterwards. So we had been given the notice, that we have to move out of the area, [...] and one day they were there and boom [...]. Another oppression is, that our parcel numbers are now gone. Our land has been taken on both sides of the river. We run at a loss because we had land on both sides. It is double tragedy. In fact we are wondering why. We complained, but nothing happened." (MO_M_50F)

Those living along the dyke (BO_M_75M) are complaining, as they lost some of their land due to dyke construction. The dyke is not constructed directly at the riverbanks but some metres away, and people are officially not allowed to farm the land between the river and the dyke. However, the appreciation of this perceived confiscation of land is low[109].

"They are now saying it is no-man's-land. But there is no no-man's-land." MO_M_50F

Many had simply started to plant on both sides of the dyke again. Another problem is that the dykes block access to water for the livestock, which has even led to people deliberately destroying the dykes. While old dyke constructions did not consider the livestock issue, the new dykes have ramps for the livestock to cross. Whether this will protect the dykes rests yet to be seen (Figure 18).

Figure 18 Top: Dyke damaged by trespassing; bottom: trespassing cows (Picture: own, 2006)

[109] As ministries not only lack the manpower to take care of the implementation, but also because there is considerable sympathy for those that plant close to the river, the law is however hardly ever implemented.

Another factor contributing to the refusal of the dykes is that they are not always constructed correctly. Badly constructed or maintained dykes can break during flooding (Figure 19), thereby causing even greater damage. This uncertainty was expressed by a community member who said that the community cannot say whether they are happy about the dykes "as they have not even seen that they would withstand a serious flood event" (SO_M_35M).

A further common concern was that starting to open the river and constructing dykes upstream and not extending to the end, causes an aggravation of the severity of floods downstream, leading to a disaster there. Concerning the slow progress and inappropriate starting point of dyke construction, local farmers told me that they had raised their concerns with the MP but without success.

> "I don't understand the concept of the piecework of dykes, so that new parts of the dyke are constructed while the old dyke is not repaired so that the risk of a sudden breakthrough of the dyke is huge. We are at a very great risk." BO_M_75M

This is the statement given in 2006. When revisiting the area in 2010, dyke construction had not yet been completed, and people said they did not know, why (DA_M_70M) or said it had stopped around one and a half years ago because of financial problems.

Figure 19 Broken and repaired dykes along the River Nyando (Picture: own, 2006)

While the complaints and worries around dyke construction are comprehensible; even when well-planned and established, dykes, even though protecting the society, bring negative side effects. In 2006 when visiting the people along the Nyando, they had an opinion on the dyke, especially with regard to its consequences on agriculture. In 2010 those asked (6 people living along the dyke, close to Magina) did in general see the positive impact of the dyke even though some of them had to move because of the dyke construction (see as well Ongor 2007). As positive effects of the dykes the following points were mentioned: (a) the protection of farms against the negative effects of floods, (b) the possibility of transporting goods on top of the dykes, as well as allowing children to go to school safely, and (c) the reduction of the probability of having to resettle temporarily. The newspapers and the DC painted a positive picture of the dyke construction:

> "For the first time in many years, residents of Nyando are experiencing a new way of life - a life free from the hustle of having to move away from home to escape floods every year. In the past, moving to higher ground had become a ritual. Many can now enjoy farming without fearing that their crops will be washed away." Odunga/Ochieng' (2006:n.p.)

Even though it was still stated that there was the possibility that water would come with more force in case the dykes break, in 2010 the people I talked to thought it was safer. The community chairman acknowledged some advantages; however he stated that there were disadvantages as well, an impression that was confirmed by DA_M_70M.

On the negative side it was mentioned that the reduced moisture content in the soils would reduce the overall yield[110]. In 2010, some had even stopped planting because of the dryness of the soil, while others started planting other crops, such as sweet potatoes and finger millet. Fruit trees and papaya planting was now possible and practiced as well. However, irrigation was seen as being necessary, in order to cope with the water scarcity. The need to pump water to the fields was seen as the most pressing need for many agricultural activities. Alternatively, the possibility to build water gates into the dykes was mentioned.

But would there be alternatives to dyke construction? The construction of a dam upstream, so that water could be released in the dry periods for irrigation is a frequently mentioned option by the communities. At the moment however, only small-scale storage ponds are promoted on a community level.

> "We got advice from certain people to dig water pools during droughts so as to conserve water. And if you visit any of the members you'll find at least one water pool that has an inlet and an

[110] On the other hand, in some areas the dykes prevent flash floods from the surroundings to find their way into the river. Stagnant water in the wrong places is seen as leading to outbreaks of waterborne diseases.

> outlet such that when it rains water collects into the pool and once it is filled water flows into the field. We have even organised field days for MoA, VI, chiefs of lower Nyakach." GD_NYA

A small-scale structural measure to allow for fast drainage of flood water might be the digging of small channels by hand within the LNB. Chapter 7.3 will deal in depth with those channels. Besides measures that deal with the floodwater, soil conservation upstream could lower the run-off and the siltation of the riverbeds and drainage channels and thereby decrease the problem of flooding. Efforts in this respect are on-going but have not been studied here in detail as they are outside of the study area.

7.2.2.2 Living with the floods - early warning and relocation

> "You know, it is quite discouraging. You plant and then the floods come and destroy. […] Back then the floods were different. The rivers would just swell without destroying property." DO_AW_70M

Apart from prevention, living with floods is an important option in many parts of the world. Living with floods in the Lower River Nyando Basin includes the construction of small dams around the houses and the construction of raised platforms and granaries on the compound to store important items (including food storage and preservation of food for times of hardship) and to protect people and livestock, as well as building embankments to protect walls; if necessary, scooping floodwater from the house is an additional method. People normally stay in the houses when they are flooded and try to block the water by building small embankments all around the house and sealing the entrance if necessary. However, the encroachment of water into people's houses happens frequently. In case this happens, belongings of the household are simply put under the roof and people cook on the table[111]. Sleeping under mosquito nets, and treating water are further options used to cope with the consequences of floods (own observation and described similarly by Ochola (2009: 154)).

The plantation of drought and flood resistant crops and early harvest, digging trenches or channels to drain water faster, as well as the redistribution of fields according to flood expectation are options to protect agricultural activities or ensure at least a minimum harvest.

> "Respondents reported that they reduced the magnitude of crop loss by planting fast maturing crops. Some households switched from growing vegetables and maize and instead resorted to planting rice, others opted to renting land on higher ground to avoid expected future losses while others resorted to other businesses to supplement income." Nyakundi et al. (2010: 359)

[111] Here it would be interesting to analyse the relation of people to nature (e.g. role of water in houses in Europe).

In order for some of these measures to be effective and to reduce damage during floods, adequate and timely information about the to-be-expected rainfalls, as well as early warning are necessary. Those aspects will be scrutinised below.

The following conversation shows the perception of an old inhabitant of the region and the local ability to predict floods:

> "We are so conversant with the weather; we know when there will be floods. We use the birds for prediction of rains and floods. Strong winds from the lake are a sign of coming floods. Clouds in the mountains are a sign of floods to come. The depth of the floods to come is predicted by the colour of the clouds." DA_M_70M

The table below gives an overview of traditional early warning flood indicators (Table 17) (similarities exist to the indicators used for predicting rain (see Chapter 6.4.2))[112]:

Behaviour of humans, plants and animals	Large number of cow egrets sighted Old people's bones aching Loud persistent croaking of frogs Domestic animals making noises Migration of ants to higher ground
Knowledge of weather pattern	Heavy rains in the area for long periods of time Heavy rains in the Nandi Hills Lightning and thunder on the river Temperatures higher than usual Strong winds blowing from river to the hills
Knowledge on nature of river	Rising of the river Debris in the river Noise level of river increases River water turns dirty brown
Knowledge of flood cycles	Knowledge of seasons Knowledge of flood cycles

Table 17 Traditional knowledge for flood prediction (per category from frequent to less frequently mentioned) (adapted from Nyakundi et al. 2010)

The KMD and the ICPAC are responsible for the weather and climate data as well as forecasting (see Chapter 0). However, information given is often described as being deficient, so that traditional ways of flood prediction are still important.

> "We do not stick to the meteorological department. We know when the water will reach. These days, the water comes very fast, within 12 to 24 hours. " DA_M_70M

In the annual report of the KRCS (2004) Adede states: "The first day of serious flooding was the 11th of April 2004 and it took all of us by surprise." Equally in March 2006 the Daily

[112] According to Nyakundi et al. (2010: 355f) age, own experience and occupation (e.g. farmers know more about floods than other groups of people) influence knowledge about floods.

Nation (DN) reported "the floods, caused by swollen streams draining River Nyando hit the area at 1 am as most of them slept." (Daily Nation 2006a) and in November 2006 it was reported that "the minister said the Government was overstretched because it did not anticipate the situation (Daily Nation 2006b). While also the traditional knowledge cannot prevent surprises, the lack of information is blamed on the KMD, prompting a researcher at ICRAF to tell me:

> "The citizens, they are saying, that even the animals are better weather forecasters than the meteorological department, because there are hardly any cases of animals drowning in the game parks during the rains and floods." (AA_R_40M)

Some damage could be avoided, if a working meteorological information system informed people about floods ahead of time. Short-term weather forecasts would help people to save some of their goods and livestock instead of being woken up with their bed floating, while long-term forecasts could be very beneficial for agricultural planning[113].

Unfortunately the mistrust (Chapter 6.2.1) in the KMD that is expressed above has negative side effects. For example, it had issued warnings of possible widespread flooding prior to the El Niño, but was not taken seriously. As no precautionary actions were taken (Mutua 2003), the floods hit an inadequately prepared population[114]. Locally for example I was told that people would wait until the floods come, in order to avoid moving in vain (DA_M_70M). While the chances of the KMD being wrong might be small in the long run, the old way of predicting might still be preferred simply because people know how to deal with it.

To compensate for some of the missing information or missing trust, a local warning system has been established by the Disaster Management Committees and through the different KRCS branches in the whole of Nyando catchment area. A number of indicators are used to estimate the probability and potential magnitude of floods; such as e.g. high rainfalls in the upper part of the catchment, measuring of the river depth and the water colour.

The relocation of people either on a permanent or on a temporary basis (e.g. seeking refuge with relatives) can be seen as the last step taken in coping with or adapting to floods. Temporary displacement of people during floods commonly takes place. In order to prepare for that, widespread evacuation drills took place all over the plains (see Figure 20) and evacuation paths have been marked.

[113] In December 2012, the floods hit the people quite unprepared. A resident is quoted to having said: "At least it has happened during the day" (Juma Nyapol in Oudia 2012).

[114] Nyakundi et al. (2010: 359) further blame the dykes as leading to a false feeling of living in a flood-free area, thereby reducing the motivation to prepare for floods.

If evacuation becomes necessary, women and children will move to the evacuation points, which are routinely erected, e.g. on church grounds or schools, while men stay behind to take care of the cattle. Nyakundi et al. (2010: 359) found:

> "To cope with loss of pasture the highest percentage of households moved their livestock to higher ground while others travelled long distances to look for fodder for their animals. Other coping actions included replacing what had been lost, treating livestock and selling weak and vulnerable animals before the onset of floods."

Figure 20 Residents of Nyando participate in evacuation exercise (right: wwwKRCS–1, left: wwwJICA – 1 (2008))

Staying in the camp is not really favoured by the people.

> "We went to Ombaka for one month during 1997. People were put into groups in a room. It is not easy to stay peaceful during floods. You begin suffering as from then." JL_K_45M

Sharing tents, or in general the same sleeping place, as a family (especially a mother with her son, after he has reached a certain age) is culturally unacceptable and some mothers would rather sleep outside the tent, risking malaria, than sharing it with their son.

Besides temporary resettlement there have been long-term resettlement efforts. The first large-scale forced resettlement took place in 1962. At that time people had to move to places in the upper part of the Basin (Kibos, Kibigori and Muhoroni) where they got new land; others went to South Nyanza or even down to Tanzania (EO_K_50M, JL_K_45M). Resettlement however did not have the expected effect. Soon after resettlement those that had been given land returned back to the lake because the place they had been resettled to was seen as being too dry and soil fertility was lower than in the flood plains (FA_AS_75M). Others who stayed in the resettlement scheme however, kept their land at the lakeside, and are currently renting it out to other people (0.4 ha for rice plantation are rented at 5000 KSH per year), therefore it does not really contribute to a complete restructuring of the plains.

> "I have got a brother up there. He comes to supervise the work that is done on his land down here. We do most of the work for him." JL_K_45M

When asked about the possibility of resettling people, the DAO laughed and said:

> "No, floods are only for a few days or one month every year and the soils are good for planting, no one would agree to move away[115]." CO_DAO_ N_40M

Resettling the people to a nearby town (e.g. Ahero) and thereby separating living and farming areas would be another option. However, this option is hardly discussed at the local level, as there would be a problem of transportation down to the farming areas on a daily basis because people fear for their safety in town.

Another option for preventing or living with floods is to wait for external aid. The following chapter will discuss the impact of external aid with the example of relief aid and food for work.

7.3 *Relief aid, food for work and the discussion around aid dependency*

> "Food for work has helped the unable women in the society." GD_NAK

Calling for relief aid is a common coping strategy of the local population. The first relief and development agencies are remembered to have come after the Uhuru Floods in 1963. In the 1960s relief aid was channelled through the churches, with chiefs having the power over them. Nowadays most of the agencies distribute relief themselves in cooperation with the communities. Often communal relief supply committees are led by locally elected women.

During the Floods in 2006, the overall affected population was 6720; with 1120 people being displaced and 3360 people receiving relief aid (KRCS 2007). The most commonly distributed items to the flood victims are: blankets, mosquito nets, tarpaulins and aqua taps (for water purification). Maize, beans and cooking oil are distributed as food relief. Besides that, people would need firewood (or charcoal), but it is hardly ever given (GD_KAO). While there were constant complaints that the aid was not enough, there were also rumours that people deliberately destroyed dykes in order to get relief aid.

Relief aid focusses on the immediate needs (medicine, blankets and food). However, more significant to the people is the loss of crop seeds and livestock. The local population complained that they "are abandoned" (JOO_R_60M) after blankets and mosquito nets have been given. The leader of a local NGO stated:

[115] Besides, people are scared to move to other areas as there have been cases (especially during the clashes of the 90s) of people being chased away that had been given land in the settlement schemes.

> "It is quite unbelievable! People have lost up to five hectares of beans […] and then the Red Cross only comes to give a blanket that costs one hundred shilling." EO_AW_40M

More generally it was remarked that people often do not need the items given. This is why they are sold on the local market and exchanged for other goods. This practice was known to the manager of the local branch of the KRCS. However, he mentioned that the distribution of money instead of items was not possible, because the headquarters of the KRCS in Nairobi feared that money would not reach the communities.

The focal points for the distribution of relief aid often are evacuation camps. This can lead to strange situations. In 2004 the Red Cross reported that a number of people only stayed in the camps during the day but went home at night. And in 2006 when I went with the Red Cross in order to check on people who were said to have looked for refuge at a school, which served as an evacuation side, we found the place almost empty (Figure 21). However, when they saw the Red Cross coming people were fast to ensure us that they could all come back to the evacuation side in case this would be needed in order to receive aid.

Figure 21 Evacuation side in Kakola-Ombaka (Picture: own, 2006)

Some of the examples above already hinted to the fact, that external interference might not always have the intended effect. This question is treated below with regard to food-for-work programmes (FFW).

The most highly regarded flood control measure carried out in 2006 was the opening up of drainage channels through FFW. Drainage channels supported by FFW belong to structural flood prevention measures (Chapter 7.2.2.1), but they are treated here separately due to their high importance on the ground and because they give the opportunity to discuss the

role of external inputs with regard to dependence and taking action; and thereby with regard their impact on risk and resilience.

FFW started in 2001 as a move away from "just issuing hand-outs" (PO_DDON_40M), instead offering an acknowledgement for communal work in the form of food.

> "Food for work should be seen as a solution to a problem and not as a new livelihood." MGU_NCA_40M

The FFW programme in 2006 was executed by CARE together with VIRED. The project was conducted in the 18 sub locations most affected by floods. In each location a flood control committee (FCC) was installed, with six members who had been elected by the community. The task of the committee is to prioritize the areas to be worked on. The chief is the patron of the flood control committee and also responsible for the initial mobilisation of the people through Barazas[116]. He has no role in the FCCs but is asked for arbitration, e.g. when people do not want to have channels on their farms or when disputes about participation in the FFW occur.

In order to avoid wrong conception of the community, thereby creating dependency, it is emphasised that the communities should see the food (maize, oil and beans) not as a salary; but rather as an appreciation of the work done. In so doing it is hoped that work on the drainage system will continue after the project terminated. Continual work is necessary, as long as erosion in the upper parts of the catchment continues, and the canals therefore get blocked fast.

Communities in general favour the programme. However, the acceptance of FFW depends on the overall food situation. In June/July 2004 the food situation was bad so the communities were willing to work hard and competition between people was high. People tried to show that they do good work in order to be chosen again (CARE 2004). Quoting a beneficiary, CARE stated:

> "FFW has come at the right time... The beans have made the women healthy and fat, their faces glitter and they have become very productive!" CARE (2004: n.p.)

People even came from as far as Homa Bay (around 90 km away) for the FFW. While working on the FFW they stayed with relatives. GM_CARE_35M even said that the FFW would create "islands of affluence in a sea of poverty". A woman from the area, but married elsewhere told me stories about her mother participating in FFW, even though she did not really need it; "but the food given would have just been too tempting". She said:

[116] Some of the question asked during the introduction of FFW were: (a) How many people are allowed per day?, (b) Are disabled people allowed to work?, (c) What happens if there is an accident during work? Is medical help covered by the project? (d) Why are only 300 people allowed per day?

> "You know the people really like food for work, there in Kakola. They call it our work. If at all you do it twice a week and then you'll get beans and oil. You do such a small piece of work and then you'll go home and rest and just wait for the oil and beans to come. It is only that it can create laziness." NO_JE_30F

At one point in time the number of working days allowed even was reduced to 3 days per week and person, as many preferred FFW to working on their own farms. Ochola (2009: 67) criticizes FFW as according to him it "makes the most economically viable members of the households to abandon their farms to work in the food-for-work programme", thereby retarding sustainable development. The potential long-term impacts of the FFW will therefore be discussed below.

With this regard, one question is whether the communities will continue opening up drainage canals even without payment. In the official language of NGO reports and the rationale for the funding of the FFW it is emphasized that it is hoped that people would learn about the benefits from the canals, and continue working on them after the end of FFW. In reality it is rather the other way round. That canals help with regard to flood control is known to the communities. Old people remember that drainage channels were opened without waiting for FFW some years back and wonder why the society has become that lazy these days. Many expressed the sentiment that people had gotten used to the support coming from outside and therefore stop working as soon as there is no compensation in the form of food.

> "We find that there are donors. If you do a duty they will pay. So, our people are not interested in working for free. To work without being paid is not easy." JL_K_45M

> "People stopped digging because at that time the Catholic Church brought food (rice and oil). So than it filled up, nobody did anything a lot of harm was done." MN_J_30F

Something similar was stated for the preparation of water pans to store run-off water.

> "The community did five water pans themselves, but later on the ministry came and gave the people food to make more. Now they say they can't do it themselves." CO_DAO_ N_40M

Actually, this statement (again) shows how external interventions can make people passive or re-active, as they will first wait whether external help will come, which can bring along delays. It could be stated, that the felt opportunity to do something ('risking something') is replaced with a felt dependence on external decisions to help. However, it could also be said, that people decide between waiting in vain (and thereby not getting a harvest at all or losing some of their resources due to floods) or investing in vain (and thereby losing the inputs). Or even further, instead of investing their labour in voluntary flood control, they decide to invest their time in a job (or finding a job).

In the group discussion in Achego people stated that the arrival of aid had made most of them very lazy. Some even said that it would be better if the FFW would have never come:

> "It would be better, if they would not come. Forefathers could protect themselves. Their approach [FFW programmes] was bad. They should have given the community farm tools instead of maize. Not like Manna; this only makes people lazy. Instead they should have brought us ideas on how to do proper farming or maybe loans to work on our own." DO_AW_70M

The District Agricultural Officer (CO_DAO_ N_40M) stated that "people could do a lot themselves, but they think they need some help" and said one should not go to an area in which somebody had already spoiled the attitude[117]. Especially, as "local communities think that one NGO goes and the next one will come", as was claimed by the staff of the NGO Africa Now. The Swedish Cooperative Centre-Life Project stated:

> "Attitude has been a major problem towards personal growth for so many people, farmers included. For example, the attitude of hand-outs has greatly affected the ability of many people to make their own decision, work hard towards achieving their vision and be self-reliant." SCC (2004:n.p.)

Similar, when I asked the officer of the KRCS Nyando branch why the community did not work together themselves to open up the channels; he said that there were a lot of rumours about projects coming. According to the manager of VIRED, the work will not continue after the FFW has ceased, because "people want to be pleased" (JOO_R_60M). Similarly the DSDO Ahero stated that people think too much that they should be paid, or even think they need to be paid in order to improve their situation.

> "There is a culture of hand-outs, which destroyed community norms and stability." PO_AW_80F

However, in few places (e.g. Kadhibo) people seem to have been doing some desilting even if nothing was given (GM_CARE_35M). According to the project manager of CARE Kenya in Kisumu, the attitude of the community towards taking their own initiative or waiting for donor foods depends mainly on the leaders and community structure. According to DO_V_35M, some councillors and chiefs will even tell the community not to open drainage canals unless they are paid. Therefore, some people do not blame missing willingness to take initiative on the FFW, but attribute it to a change in community set-up, the attitude towards development and a loss of power of authorities.

[117] During my fieldwork I even came across a manual about the "Power of Attitude Change". It stated: "The purpose of this material is therefore to help you as a person in taking action to develop a positive mental attitude for a positive life and success. Remember, attitude change starts with you as an individual. [...] We promise you that with this dedication, you will transform your life within no time. So let's take action!" SCC (2004:n.p.)

> "Sometimes back there was no FFW; people were forced to do the work. Assistant chiefs and Chiefs had the power to force them; even the ministry forced them." EO_J_30F

I think it can be stated that future projects indeed have to deal with the high expectations and maybe some kind of 'consumer attitude' of some people, as communities know that they can get something if they cooperate with projects. The question, however, is whether this should be seen as having negative impacts on development (or more concrete here: long-term flood protection or agricultural production), or not[118]. Trying to get as many benefits as possible for any work being done can also simply be seen as a reasonable strategy to get additional inputs. In case people take initiative again, as soon as help ceased, it will not necessarily have negative consequences. For example, according to the NIB senior manager, the farmers he worked with first requested money. However, when he told them there would be no money, they took initiative themselves (NIB_A_45M). One way in which FFW could create real dependency, is, if it would introduce a new technology that would no longer be accessible as soon as help stops. The channels however can be regulated, built and maintained locally. To the contrary, by changing a situation, external input might even lead to necessary innovations and thereby reduce dependency on relief aid. For example, the chief of Kochogo approved FFW, as according to him floods had become routine in the area and it was only through FFW that people realized that they could still do something about the floods. "Before, they only thought of relief" (C_K_40M).

But is it really the community's responsibility to take action? The focus on community action by external actors is contrasted by the community's' perception that the government should come in with large scale projects in order to improve the situation. The people's hopes concentrate on large-scale projects and infrastructure development (up-stream dams and deepening of the rivers) which would have to be done by government (see as well Chapter 0.1) (GD_KAO).

> "The government must find a lasting solution to Nyanza's flooding menace." Daily Nation (2001)

Claiming that or behaving as if there is nothing the communities can do, the community might try to make the government feel responsible. If the communities believe that the only one that can improve the situation is the government then they really depend on external decision-making, however otherwise the inactivity might rather be a political strategy to get additional resources.

[118] Whether the FFW did have a significant impact on the local market, thereby creating a problem for local sellers of maize, oil and beans was not assessed here, but due to the small amounts, it does not seem to be probable either and it was never mentioned to me as a problem.

Furthermore, the siltation of the drainage system is mainly caused by erosion in the upper part of the catchment, so why should the downstream population clear the channels? In this regard, it could be asked, whether the external help should be called a hand-out at all. For environmental protection ICRAF worked with a community group by providing them with seedlings to be planted in an area of severe soil degradation. During the long dry period 2005/06 they started giving out maize to the farmers to pay them for planting, watering and protecting the seedlings. I was talking to one of the project managers (a Kenyan) about the way the work is done. He told me how much effort it took him before his boss agreed to give maize to the farmers for planting trees on their farms. It took me some time to make him talk freely about this, as he was aware of the bad image that distributing hand-outs has. However, he got very emotional later on when he said, that he would be really rude to the donors, as soon as he got his first own project. According to him, the farmers who planted trees were basically doing a favour to the project by working on the badly eroded areas, because they were not going to benefit directly in the short-term. Sure, by improving the fallows and stabilising the gully, people will conserve the environment and therefore their source of livelihood in the long run – but does that mean, that they should not be paid for the work they are doing? Concerning the maize given to them, people in the group discussion in Nyakach said:

> "ICRAF is okay. They also know during hunger, that its impact is serious in Nyakach and so they bring us staple food, so even as you work you are sure you'll eat." GD_JE

While hand-outs are regarded as giving the wrong sign, a comparison with Europe can change the picture. Not only is agriculture highly subsidised by many European countries, farmers further are rewarded if they do organic farming or protect some ecosystem services. Especially in the case of planting trees in order to stop erosion; instead of talking of hand-outs or subsidies, one could also consider talking about payments for environmental services. This has the great advantage of giving farmers the right to claim payments, instead of 'begging' for help. Thereby they would gain more control over the resources reaching their area. Similarly Harvey/Lind (2005) state:

> "The focus should be, not how to avoid dependency, but how to provide sufficiently reliable and transparent assistance, so that those who most need it understand what they are entitled to, and can rely on it as part of their own efforts to survive and recover from crisis." Harvey/Lind (2005: 1)

7.4 *Floods - normal event or disaster?*

> "Every 5 years we are having heavy rains and the floods take place. 2003/2004 was quite heavy. Nothing special is done: It is just normal." JL_K_45M

> "A knife is a good thing, but it can be dangerous if you cut yourself." A_KR_45M_during the KRSC Workshop on Disaster Management

This chapter discusses whether floods in the Kano Plains are a disaster, and why it is relevant to ask this question and thereby comes to a holistic understanding of the significance and role of floods. While the floods of Western Kenya are well-known and occur quite regularly, every year there is another outcry, when rivers cross their basins and the floods cause problems (see Chapter 7.1).

> "In this village, we have always been displaced by floods and this year will be no exception. My two cows died of hunger during the dry season and now I must prepare to move my family to higher grounds to avoid being swept away by flash floods." Ochola, A. (2006: n.p.; quoting Ochieng)

However, they are also said to be the hope of the people that they cannot live without (C_K_40M).

> "Without floods there is no life. We would wish to have a flood every three years." GD_ACH

So the question is whether or when they are (or should be) labelled a disaster.

The decision to declare the floods as a disaster or not is heatedly discussed in Kenya. The East Africa Standard uses a mild and broad definition of disaster:

> "Natural disasters are extreme, sudden events caused by environmental factors that injure people and damage property." (EAS Nov 20, 2006)

Some other definitions of disasters have been briefly discussed in Chapter 3.1.4. Those definitions will be used in the following in order to analyse the situation.

When using a quantitative definition focusing on the negative aspects of floods alone, as done in the EM-DAT database, many floods in the LNB might actually qualify as disasters, as often more than 100 people are affected. A quantitative criterion was also discussed on an administrative level in Kenya. On the district level, the DDMC is responsible for declaring a disaster. During the DDMC Meeting of 2000, the measure agreed on was to declare a disaster as soon as more than 50 people were affected (DDMC files).

Doing a cost-benefit analyse would be another quantitative way to decide whether floods are a disaster in the long-run by draining available resources. In Europe floods mainly re-

ceive attention when they hit urban areas or villages and are causing great material damage, while basically no benefits are related to the floods. In cities and villages it is therefore tried to reduce the occurrence of floods to a minimum. However, in the Lower River Nyando Basin most houses are surrounded by agricultural fields, and therefore a cost-benefit analysis is more difficult to make. The local population is aware of the positive impact that the flooding has, e.g. on the replenishment of soil fertility and flushing of salt from the surface layers of the soils. While it might sound terrible to us that people have to use a boat around their houses, locally many say that people want the floods and that it is worse when there are no floods[119]. To put it succinctly: "'Pi ber." [The water is good.] AL_K_75M

In the questionnaire administered to 19 households in Kakola-Ombaka ten people mentioned higher yields or soil fertility increase as benefits of floods and five people mentioned good fish yields.

> "Always we do get better harvest after flood water has receded to the lake." GD_KAO

The possibility of fetching water close to the home during floods is seen as a further advantage by some women (Ochola 2009: 153). It is therefore unsurprising that the flood plains are a preferred place for human settlement.

> "Those who suffer from the floods are also advantaged, as water is a precious resource." CO_DAO_ N_40M

The wetlands along the lakeshore, which are flooded almost every rainy season, are a buffer against the impact of prolonged dry seasons. They do serve as important reserve grazing grounds for livestock during prolonged dry spells[120]; and it is possible to farm in the wetland area after burning of papyrus and reed (see Chap 5.3).

Whether on average the benefits outweigh the costs, depends on flood characteristics such as its depth, the time of arrival, as well as the duration of inundation. Floods in the LNB can be separated into two categories: normal floods have a depth of around 50 cm; they only stay for a few days and normally cause little or no destruction. Those short duration floods, if at the right time, are an additional and welcomed irrigation of the fields, which will increase the harvest. Extreme floods on the other hand reach a height of up to 1,50 m, stay for a longer period of time and cause destruction of houses and force people to leave.

> "Floods that are staying for more than a week are causing problems to agriculture." DDMC (2005: n.p.)

One of the recent most extreme floods occurred during the El Niño in the 90s:

[119]The issue of trade-off becomes even more difficult, when thinking about the potential death of a person because of floods and comparing it with the increase of soil fertility which will feed hundreds of people.

[120] This is easily visible: during the dry season cows at the lake shore look much better fed than others.

> "In 1997, El Nino, things went very very bad, no harvest was seen, but a lot of fish and most people migrated to the highland. It was bad because you need some help, government distributed relief but not enough." EO_K_50M

But even regarding this extreme event, there are different opinions. There are people who remember these floods as good and not having been a disaster, as the harvest following the floods, was very good. This also shows the importance of spatial variability.

Another criterion to define a disaster is, whether people know how to deal with them or not; whether routines exist.

> "We have lived here from time immemorial. My father inherited this land from my grandfather and I have no good reason to leave. Flooding is a normal occurrence and we have learnt how to stay around." Ngome (2002: n.p.)

> "Water is not a problem; we all know how to swim. The kids do learn swimming in the early ages. Nobody fears water." DA_M_70M

According to the DEO people are adapted, even though they might seem to be suffering when looking at it from outside. In Kakola-Ombaka when asking people what they needed during floods, people said they would 'just buy' what they needed during floods. One farmer, who had just planted and discovered soon afterwards that floods had destroyed all his young crops, said he was annoyed, but they were used to such situations. Therefore, following the definition that a disaster is a non-routine situation (see Chap 3.1.4), the regular floods happening in the Nyando Basin might not classify as a disaster. Similar, Macamo states for his study region in Mozambique:

> "So long as routine responses are an option, floods are not a problem." Macamo (2008: 110)

Apart from the question on when to call something a disaster, the question why something is called a disaster is of importance; e.g. when a state of emergence is declared, or a call for international assistance launched. In December 2006 there was a discussion in the national news on TV about whether an on-going drought should be called a disaster or not. Arguments ranged from 'yes, in order to get help' to 'no, definitely not. We are able to handle the situation ourselves and do not want to ask for help'. In a SMS poll 58% of the people voted for "yes". NGOs that supported the declaration of a national disaster were blamed for only being interested in getting funds, while the government was trying to say that it could handle the situation (in order to show their power):

> "A government declares a hazard to be a disaster as a diplomatic way of conceding defeat and thus begging for material hand-outs from the international community to keep her people alive." East African Standard (2006)

When analysing in more detail when and why a flood is called a disaster the strategic aims of the actors surface as well. Often it is rather a political decision of showing or gaining strength or getting influence (see Chapter 3.1.2 (Foucault) or Chapter 2.3.2 (Görg)). During a short rainy period in April 2006, floods inundated houses and fields in some villages close to the lake. Immediately, the newspaper stated that a disaster had happened in Nyando District. Following that, the DC called a DDMC-Meeting[121] and was busy contacting his provincial boss as well as the newspapers in order to point out that the situation was under control and that there was definitely no disaster. The DC was annoyed, as the Standard Newspaper had given bad reports on what was happening in his District; stating: "these people want to sell their papers". He told the members of the DDMC:

> "How do we react to misrepresentations? In the Newspaper there are bad reports; the picture is not as bad as painted."DC_N_55M

When he had the Provincial Commissioner on the phone he informed him that:

> "The newspaper is cheating the country. […] We are constantly watching. The DDMC is meeting today." DC_N_55M

Following the DC's complaints, the Standard Newspaper even revised their article from April 27th and reduced the number of people stated to have been affected; from 1000 people (Ayodo/Jack 2006) to 350 people (Ayodo 2006) on April 28th. The DC was cited saying: "there should be no cause for alarm as the security detail would help in case of an emergency" (ibid: 4).

The DC further explained that the villagers only had themselves to blame.

> "Swamp, that is a swamp! It is state land. The people invaded it and now the water is invading the area." DC_N_55M

Similar during floods in January 2013 the DC remembered the affected communities that they should not cultivate near the dykes as it would reduce the ability to prevent flooding, thereby putting the blame on the community. On the contrary the Nyando MP Fred Outa stated that it was the Governments responsibility to implement a policy to find a long-term solution to the floods menace (Oketch 2013) [122].

Nevertheless, in 2006, the DC together with the head of the KRCS Nyando went down to the flood affected area. But down at the lake the population was more interested in telling

[121] The meeting, in which I was permitted to participate, also showed that nobody really was focusing on disaster management. The DC read the minutes from the last meeting and thereafter basically everybody was complaining that there were not enough funds to do the daily work. E.g. the representative of the Ministry of Forestry, complained that they had not cars to transport trees, and so on.

[122] During the visit in flood affected Miwani, I similarly got the feeling that the situation was not as bad as stated in the newspaper. However, while being there, the MP arrived together with a television team. He argued for the urgent need to find a lasting solution.

the DC about the problems they had concerning missing schools and HIV/AIDS than they were eager to point out the specific problems that the floods had implicated. I got the impression, that floods were used in order to get the attention of the administration. Also in Kakola-Ombaka people stated that due to the floods of 2003, the Provincial Commissioner of Nyanza Province visited their place for the first time in history (VI Agroforestry 2003).

Above I highlighted different reasons behind calling something a disaster. In the following I will concentrate on the consequences of labelling an event as a disaster. I hereby want to argue that it is not just an academic exercise to bother about 'labels', but that in fact it has a practical relevance.

While the LNB is mainly known for being flood prone, the picture looks different on the ground. Floods are just one of the disasters mentioned by the manager of the KRCS Nyando Branch. Apart from rapid onset disasters, such as floods, wild fires, whirlwind, road accidents, slow onset disasters such as drought and HIV/AIDS are equally mentioned. However, especially the slow onset disaster of droughts often does not get the necessary attention in the LNB, as it is regarded as being a relatively wet region:

> "They rarely come when there is no flood. Because people were displaced the DC managed to come." EO_AW_40M

The floods are constantly highlighted in the newspapers and in public discussion and therefore attract aid, the long dry spells which are equally bothersome for many farmers get much less attention; yet dry spells severely impact agriculture (see Chapter 6.3).

> "Nowadays we have little rainfall; there is too much drought that kills all crops. Long-time floods would come but would spare some farms that eventually yielded well. But these days if you come to Odino around here, you'll find that the yields are so poor not because of floods, but because the rains come too little maybe 2 months and then drought falls and all crops die." GD_KAO

The missing attention to the droughts might be attributable to the fact that droughts in other parts of the country are more dramatic, but probably also to the fact that droughts are less visible in the area than floods. Floods lead to immediate damage and provide impressive pictures, while droughts in the LNB basically 'only' lead to crop failure or very low yields.

In order to understand what the community remembers as important events, the timeline (Figure 22) was created in a group discussion in Achego and completed with other data collected by myself and other agencies. It focuses on extreme weather events, agriculture and food security[123]. It can be noted that floods are not mentioned more often than

[123] Apart from that, the following events were mentioned: establishment of schools and churches, infrastructure developments (roads), creation of Nyanza Province, Kisumu and Nyando District, construction of health facilities, death of important politicians (like e.g. Tom Mboya).

droughts. A further hint that floods seldom are seen as a remarkable negative event is that people have no names for flood events whereas they have names for famines[124]. Therefore it can be stated, that locally food security is perceived as a bigger problem than the disruption caused by floods[125].

1918	First human settlement
1931	A swarm of grasshoppers descends to Achego clearing all green vegetation in the vicinity. This resulted in a serious famine locally known as Nyangweso
1932	Following the serious famine of the previous year, many people from Achego migrated to Tanganyika, modern day Tanzania.
1934	*Ke Otonglo.* [The hunger of the ten cent coin]- There was famine after the Locus infestation on crops
1941	Locust Infestation
1942	*Ke otonglo*
1944	Bumper harvest of all crops
1947	Heavy rains destroyed crops that year and there was no harvest. This led to famine. Smallpox killed many. This was followed by massive vaccination. Elisha Olanda, a priest in the Anglican church, died
1948-1949	Construction of soil conservation structures. *Okuta* or bands of trees were planted on the conserved areas – grass known as *modhn* was planted by the community.
1948	Cattle died of drought and famine, even the River Awach dried
1950	Rice was introduced
1953	There was a bumper harvest of Sorghum in Achego. Most of it was left in the field, as there was not space in the barns. This was immediately followed by serious drought that forced people to migrate with their livestock to the area near L. Victoria in search of pasture (VI PRA). *Ke angwani/angawe* (famine that grabbed people like a monster): Great famine there was no food (especially cereals) available because of a prolonged drought.
1957	*Ke olima* (musician). Famine and the government distributed dry fish as relief food.
1958	*Mak chon chuori chungo I chung malo* [You have to use the husband's knee to stand up – no help from outside]; a devastating famine
1961	*Ke Mogo* Famine. Government distributed Maize flour as relief food
1961-1963	*Uhuru Rains*: Heavy rains when Kenya got independence. Transport was difficult between Nyakach and Kano people. Great flood in Magina Sub location. The Community was relocated and some had to be airlifted to be relocated
1964	Growing of rice variety *Singa Majan* after the rains in 1963. Through Rice growing the Catholic parents managed to take their children to boarding school and Nyabondo Mission in Nyakach

[124] More information would be needed to interpret this timeline in depth; e.g. the reasons for famines, or the reasons behind mentioning events as important

[125] A similar observation was made for the floods in Mozambique (Macamo 2003).

1965	Nyatini bridge collapsed and travel to Kisumu became impossible by road. People were trekking on foot. They started noticing some change because of government.
1970	Cattle died of Rinderpest, First birds to attack rice field were noticed. This also marked the beginning of the vigils at the rice fields to keep the birds away.
1975	Start of cotton farming in Achego. Micro-financing for cotton and maize was introduced in Achego.
1976	Rice farmers started their own co-operative society
1978 or 1983	*Ke Gorogoro* [The hunger of the 2kg tin] Famine. Relief aid was given in 2 kg tins. The famine separated people to look for food.
1981-82	*Ke Onding* Famine. The hunger were yellow maize from the USA was given as relief food.
1987	Nyachoda Rice Scheme was established by PIU
1988	Construction of canals and Koech canal/manyasi was constructed in the area. Funding was from EEC
1994	There was famine known as *di roki* – just eat a little
1997	El Niño rains; the community migrated to churches, houses destroyed, rampant malaria infections – *Pi Saddam* [Water was black from Iraq war]
1998-99	Kipindu pindu – Cholera outbreak in the area Measles Immunization for under 5 years undertaken for six days
1998	The Starting of Ayweyo Market (Canteen) by Mariwa Gek and Jackons Okuna
1998	Due to drought, sugarcane died in the field. Locust infestation
2000	Floods destroyed fields
2002	Army worm infestation
2003	Flood Destroyed field - KRCS
2004	Flood control by Community efforts
2005	Long drought, animals died, crop failure
2006	Prolonged drought, long rains delayed

Figure 22 Timeline of important events (GD_ACH; and other agencies)

According to my analysis, the perception of the floods as being the main problem (a disaster) led to misguided action with regards to water management, as the example of the Awach shows: Besides the construction of the dykes, river deepening and straightening was used in 2005 by the MoWI to increase the discharge volume and speed up the river flow. The farmers noticed the first negative consequences of the straightening of the river already in 2006. Three farmers I spoke to commented that according to their view the situation had been better before the MoWI intervened, as since then the river stopped meandering. Furthermore, formerly unknown pests (*obwanda*) and erosion along the riverbank occurred (FWO_AW_40M).

> **"**People were crying that floods were destroying, but now they are crying again." FWO_AW_40M

"I wish I knew" was Richard's (RN_AW_35M) comment about the effects of the river straightening. While partly blaming the MoWI, he acknowledged that he himself had looked at the problem from the point of view of house preservation. Only later he realized that he would suffer from a lack of water on the fields and would have to rely solely on rainfall. He stated:

> "The main problem we are facing is that, when the sun shines for a long time, our crops are destroyed. Recently there was drought that killed many animals and crops." RN_AW_35M

The long-term effects of the hindrance of floods on soil fertility and other ecological impacts still need to be seen[126]. What can be sad however is that a resilience perspective could have helped to think about this problem before it occurred, as it helps to see disturbances as being part of a systems function. The example of the floods shows that the focus should not only be on the spectacular or seemingly main problem, but also on less spectacular problems, such as droughts in this example, in order to get a holistic understanding of a situation.

Floods can be seen as a blessing and a curse. Which of the two they are perceived to be, depends on their material impact (a more or less objective assessment of the costs of the event) but as well on the expectations of the communities (rather a subjective assessment of people's perception and experience). Both assessments have their short-comings. Therefore one should be precise about what is meant when calling a situation a disaster and not label any negative event a disaster, in order to avoid stretching the concept to a useless scope (Quarantelli 2005). This would also mean to be precise about the time and space scale used for putting the label. What is a disaster in one village can be a fortune in another and what seems to be a disaster on a short-term can lead to a necessary change of the way things are being done in the long-term.

In the following I will look at the changes in the floods and their impact. It is hypothesised here, that changes in floods can be good indicators for slow and small but at the same time wide spread changes and trends in watersheds. According to Yohe/Tol (2001: 26) in fact, floods can be seen as a good object to study changes in socio-ecological relations, as the response to these extreme events often takes place before responses to gradual changes.

Floods in the Kano Plains are generally said to increase (see above and e.g. MoWI 2009). According to the Ministry of Water and Irrigation (MoWI 2009) the flood discharge in Nyando approximately doubled between 1992 and 2003 and Olang/Fürst (2011) observed that

[126] Problems going along with the dyke construction along the Nyando that only focus on reducing vulnerability towards the floods have already been discussed in Chapter 7.2.2.1.

the flood peak discharges and volumes increased by at least 10% to 16% for the study period between 1973 and 2000, with one of the main reasons being land cover change. Deforestation in the catchment decreases the buffer capacity of the watershed for extreme rainfall events, thereby leading to more extreme runoff events (see Bradshaw (2007) for global evidence) and erosion is decreasing discharge capacity of the rivers due to increased silting (see Chap 5.2). According to AL_K_75M, Nyando had six outlets before the 1960s, while currently there are only two remaining.

Further, water pollution is increasing the probability of attracting diseases during floods, while decreasing the number of fish in the flood water (which serve as a food source during floods). Additionally, traditional crops, which were available during periods of floods, are disappearing (JOO_R_60M). Besides, people say they managed to get good yields after the floods (e.g. through planting of drought resistant crops, such as Sorghum and Millet, which can do well after the floods at the end of the raining season), but are less able to do so these days.

> "There was fish and still crop yields were very high after floods. This was because those people knew how to maximise their farm outputs. People were prepared and the water was less destructive." DO_AW_70M

Contributing to the impression of changes in the flood patterns and characteristics might furthermore be a change in the impact of floods in the Nyando Basin as a consequence of a change in the willingness and capacity to put up or cope with the extreme events. For example, in case there are no seeds for replanting floods become a problem. And in case the number of electronic equipment (mobiles, radios, TV) increases in the household the probability of some irreparable damage increases as well.

All those changes might have increased the real or felt costs while decreasing the benefits of floods. In case those changes have not yet been taken into consideration the floods might have actually turned into a slow-onset disaster, which is gradually draining available resources. This also shows that judging disasters from a viewpoint of communities and their current capacity to deal with the floods also has short-comings. Nyakundi et al. (2010: 356) actually state that local perception is underestimating the real damage caused by floods. The perpetual destructions render the accumulation of resources difficult, as e.g. the example of replanting shows, as well as the necessity to repair or rebuild houses which have been damaged by the floods:

> "Farmers reported needing to replant crops two or three times during the 2007 growing season due to recurring flood events, putting strain on already constrained household resources for the purchase of replacement seed only […]." Jensen (2009: 85)

The leader of a local NGO said with regard to flood prevention measures:

> "Some people will receive it, while others will say that the floods have been there for 40 years, so there is no need to do anything" EO_AW_40M

With regard to long-term impacts, extreme floods can serve as trigger events, as catalysers of change. On a national level, the experience of the El Niño of 1997/98 led to a turn to change in disaster management (even though still not fully implemented today – see Chapter 7.2) and on a local level the El Niño induced change in the local planting patterns:

> "Another thing that has happened after El Niño, that we had forgotten about is, that in Awach Area, we only planted once in a year and had harvest once in a year. When the El Niño came and destroyed crops we tried planting again and we had good harvests, and so we learnt that in Awach area we can have at least two harvests a year. […] There is something else we are also forgetting about. Long time ago we were planting cassava, which used to help us a lot. But since the El Niño, there is this worm that invaded the crops that made the leaves to curl and change to a yellow colour and so the root did not develop anything but just long strings, which are not edible. So now this has discouraged us from planting any more cassava which helped us a lot during times of hunger." GD_ACH

Similarly, the 2005 drought also served as a trigger, as it motivated people in Awach to re-establish a dormant rice irrigation scheme. Even though they had been disappointed before by the failure of a rice scheme, they decided to give it another try. This action however was not seen as a re-action, but rather as an action.

> "You have to change, so that events don't take over our programme. Otherwise change will change you." EO_AW_40M

The analysis of an event has to be embedded, within an understanding of the history of an area and an attention to on-going changes. As change in the society and the environment is currently taking place at a fast pace, it is seen as vital to understand how this is reflected upon on a local level:

> "The capacity of humans to detect changes in time, attribute them correctly, and to take appropriate measures, is very likely to affect the longevity and vitality of socio-ecological systems." Fernandez et al. (2002: 17-7)

With the words of resilience: Floods can be seen as a disturbance that belongs to a system. However, with changes in the socio-ecological setting also the role of the disturbance will change and might finally be the trigger for the shift to a new stability domain. To understand the role of floods all those aspects have to be taken into consideration.

8 Society-nature relations – perceiving, presenting, managing

This study reflected on the current discussions around socio-ecological interdisciplinary approaches. Agriculture as the dominant mode of production and floods as the most obvious extreme natural event impacting on society were in the focus of the case study on SNR. For summing up, I will (a) discuss the difference between nature and society and its importance for discussing SNR, (b) make some suggestions in order to sharpen the discussions around risk and resilience in socio-ecological settings, (c) discuss the role of knowledge and planning and (d) make some suggestion with regard to the development of a common framework.

8.1 *Nature and society*

As has been stated, the differentiation between society and nature is difficult in many cases. From my field experience the differentiation of society and nature basically became relevant for legitimizing claims and the judgements about the possibility to change something. Perceived recreational or spiritual value of nature was not studied. This is based on the field experience, where the possibility to materially 'exploit' nature was the most important. Most on-going conservation efforts, while directly relating to environmental issues, basically aimed at an improvement of the situation for the local community, but did not look at environmental protection for the sake of itself[127]. The society-nature differentiation was also used to discuss responsibilities. For example, the DC explained that people had invaded nature ("Swamp! That is a swamp." DC_N_55M, see page 140), so they should not complain as nature was about to take back its territory. With regard to other problems, such as e.g. rainfall, sometimes natural factors were blamed first while only later social factors were addressed. What however seems to be more important than the society-nature differentiation, is to consider whether changes or influences are seen or presented as coming from within or from outside and therefore as something that can be controlled or not.

8.2 *Trends and variability – risk and resilience*

Changes in the study area involve trends as well as variability; they come from within as well from outside[128]. Changes in social practices took place as a result of extreme events or as a reaction to slow trends. Action in agriculture often focused on dealing with changes and

[127] The only example of environmental protection being in conflict with society was the wetland protection. The discussions around wetland protection versus food production however was not followed.

[128] However, this differentiation is sometimes difficult to make, e.g.: labour shortage is related to labour migration (a trend with internal as well as external drivers), diseases that temporarily influence the labour forces (variability), or an increased labour demand as a consequence of environmental degradation.

trends (introduction of new technologies, seeds, land degradation and labour availability), thereby paying less attention to variability and controllability. For example, the introduction of new seeds insufficiently took the problem rainfall variability into consideration. Action in disaster management often focussed more on control of variability, thereby neglecting its importance for the systems functioning. On a local level again there was a tendency to neglect the slowly changing impact of the disturbance (as for example due to change in household's well-being, or change in the flood characteristics) that would nevertheless make a new way of dealing with the floods necessary.

Change will remain an important feature in the way society and nature influence each ofther. Practical management of these changes involves retaining some stability in the wake of variability and disturbances as well as being ready to completely change the way things are done. In other words, it is necessary to consider

> "[…] whether a strategy aims [should aim] at the maintenance of a given system or at the adaptation of the system towards a new state." Domptail (2013: 41)

In both cases it is necessary to maintain the opportunity to react flexibly to conditions in time and space. In order to achieve that qualitative risk assessment can help to be create awareness about alternatives and pay attention to the need of retaining some decision-making power. Resilience could help to characterize the decision-making context in the long-term by looking at changes in knowledge, buffers and diversity (as influencing the available alternatives and the decision-making power). Thereby, resilience could help to facilitate awareness of the necessity to keep some manoeuvring capacity in order to be able to live in a world full of change. E.g., if the main problem is variability than buffers should be kept, if the main issue is dealing with change than using the buffers and investing in knowledge or the development of new strategies could make more sense.

8.3 *The virtues of dancing*

The thesis did not develop a consistent theory to help to predict socio-ecological dynamics, nor a framework showing all important aspects and how they are related. And even if all the information could have been covered to model and predict future developments, this would only have been for one specific area at a certain time. However, I hope my dissertation could at least confuse the reader enough in order to open the way for critical reflections about the use of specific arguments and representation. Where we cannot claim to look for 'the solution', continuing to ask questions is of major importance to allow for reflexivity; flexibility and innovation (see also Korhonen 2007).

With regard to pragmatics: the speed at which changes take place and are necessary, is increasing. Missing knowledge, as well as the fear of the new can impede change. To avoid this, one should make sure that informed decisions are possible, especially when it comes to external interventions. Furthermore, plans or interventions should be flexible and robust under a considerable range of conditions. Ferrero y de Loma-Osorio/Zepeda (2007) are advocating the process approach (paying attention to the way things are done and not the goals), which acknowledges that "the reality of development is an experience of trial and error" (ibid: 17). They argue that the affected people should be put at the centre stage of this learning process so that they can become the subject of their own life (ibid: 7). Instead of writing more plans and studies one could follow Macamo's (2005) suggestion that we should "seek to tackle the small problems that make everyday life in Africa unpredictable" (Macamo 2005: 7) and create spaces where people can come together and discuss to find local solutions:

> "Development should consist of policies designed to solve local problems with means that do not require more than the material and intellectual resources which people have at their disposal." Macamo (2005: 7)

By focusing on small interventions it would also be easier to react flexibly and make sure the changes can be controlled and understood locally.

From a slightly different angle, and applied to farming, the capability to take decisions could sound like what has been said by Richards (1993) for farmers in Africa: He sees decisions in cultivation as being between knowledge and performance, and argues that what is presented as the outcome of knowledge is rather often the outcome of improvisation as needs arise (ibid: 62). He starts by pointing out that it is hard to tell, why some people succeed, while others do not. By looking at performance skills his aim is to transcend the narrow view of the rationality debate. He argues that a specific cropping pattern is not based on a specific design, but rather the result of “a specific historical record of what happened to a specific farmer on a specific piece of land in a specific year” (ibid: 67). A specific cropping pattern is thus the outcome of a sequential adjustment, the outcome of a specific performance in time and place, and therefore far from the sterile knowledge produced in laboratories. He therefore urges, not to “undervalue the capacity to keep going under difficulties and to treat the cropping strategies, as ‘muddling through’, not skilled achievements” (ibid: 70).

> “A celebration of the virtues of dancing might be more to the point. It is here that we are more likely to find appropriate training for those skills of balance, rhythm and articulation necessary to cross life’s tightrope in good order, and, with luck, to add a twirl or two as we go.” Richards (1993: 75)

Similarly, the management of social-ecological systems might “be more of an art than a science” (Anderies 2006: 8). But science might play the important part of trying to avoid costly mistakes (Walker et al. 2006: 3f).

8.4 Epilogue - a common framework

I have argued in Chapter 6.5 that it would make sense to develop a common framework, which gives an overview of possible perspectives on SNR. A follow up of this thesis will further venture into the possibilities and short-comings of such a framework. As a starting point some aspects that have been in the focus of this thesis, are sketched in Figure 23.

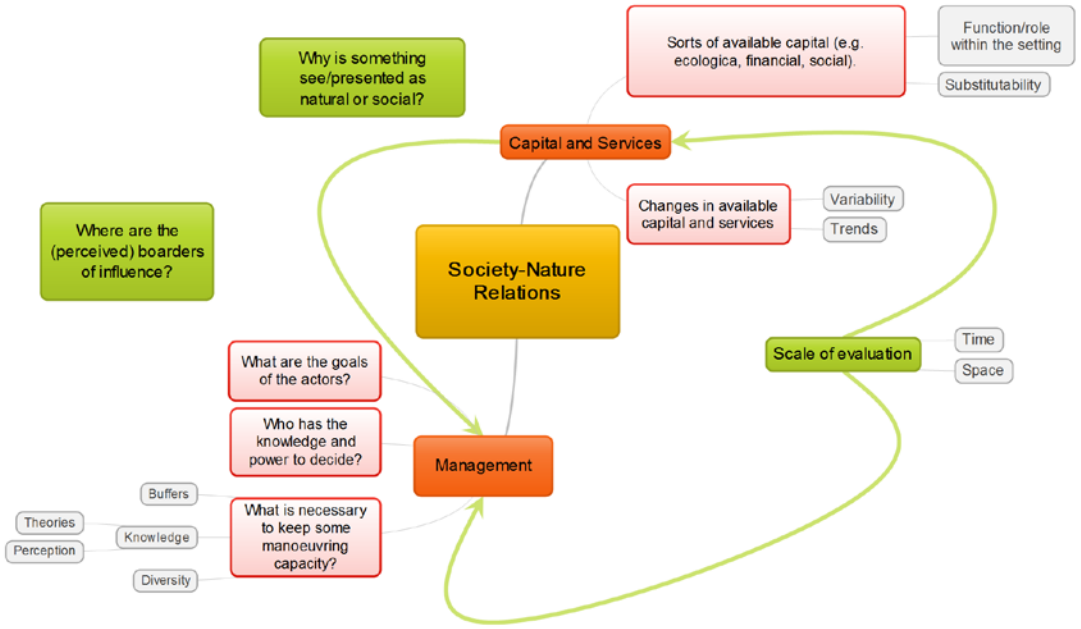

Figure 23 Towards a framework of perspectives on society-nature relations

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http://www.kenyaredcross.org/index.php?mact=News,cntnt01,print,0&cntnt01articleid=149&cntnt01 showtemplate=false&cntnt01returnid=326 (last accessed Feb 2009th)

wwwOED (2008) - Oxford English Dictionary (2008)
http://www.wordreference.com/definition/scale (last accessed Jan 2011).

9.3 *Abbreviations of group discussions and interview partners*

9.3.1 Group Discussions

GD_ACH - Group discussion Awach/Achego

GD_JE: Group Discussion Jimo East/Nyakach

GD_KAO: Group Discussion Kakola-Ombaka

GD_NAK: Group Discussion Nakuru

9.3.2 Interview partners

List of interview partners not displayed here, in order to protect personal rights.

10 Annex

10.1 *Society-nature relations*

Approaches towards the relations between the natural and the social, basically differ with regard to social causation and constraints on human society (after Dunlap 2002: 333): (a) society nature seen as one, (b) society and nature as two separated spheres, (c) society and nature as interacting and (d) society and nature as overlapping (see Figure 24).

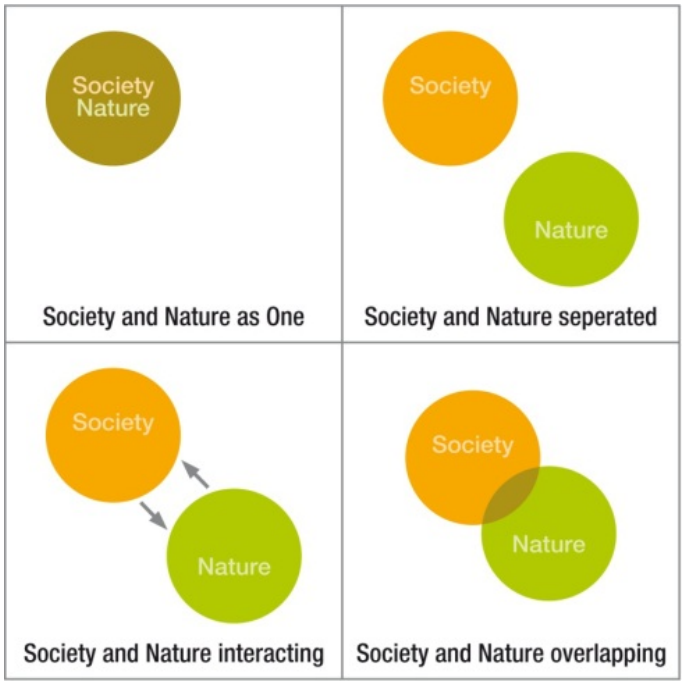

Figure 24 Society-nature relations

Society and Nature as one can be seen as the situation before the invention of science and specifically mathematics which allowed understanding regularities and patterns and thereby governing nature a bit.

Society and Nature as separated

The separation of society and nature, gave human beings, the implicit possibility to make choices, not to see them as being determined from the outside. Humans were seen as fundamentally different, with the biophysical being largely irrelevant and the belief in the capacity to fully engineer the world. It is often criticised for ignoring the limits of nature; seeing nature mainly as the product of social perception and construction (anthropocentric).

Society and Nature interacting

When trying to analyse the interaction; scientists tend to start the description from their point of view: (a) society as influenced by nature (e.g. environmentally forced migration), (b) influence of social (culturally influenced) action on nature. Approaches that want to describe the social causes of natural changes and the natural causes of social change face the difficulty of studying the influence of two spheres which are not clearly separated.

Society and Nature as overlapping

Approaches seeing society and nature as overlapping challenge conventional approaches and focus on issues such as emergence or overcoming the society-nature differentiation completely.

10.2 *Omieri*

One interesting case to see how myths are enforced because of different reasons is the case of a snake, called Omieri in the Kano Plains. Omieri is a huge Python which is seen as a symbol of good luck within Luo communities (Daily Nation 2003) and therefore needs to be honoured. The python can hardly ever be spotted, however when it appears it is seen as a sign of good rainy season to come. Interesting is how it is used to discuss the relation of the people to nature. While the relation of the snake and the rain is explained by scientists with the fact that pythons feel when the rains are to come and therefore go to raised areas in order to hatch their eggs, the argument is the other way round in the area.

> "[…] it is actually the python that causes the rains to appear, and so there is a tendency to interpret any pythons that appear at the onset of a potential rainy season as Omieris, especially if they appear near a household and remain docile and peaceful during their stay." Smith (2006: 425)

Again here, it might not be important in everyday life, what the relation is. As long as the appearance of the snakes can be associated with rains and thereby prompts the right action (e.g. preparation of the fields) the scientific and the rather non-scientific explanations have the same effect.

However, because of this myth, the presence of Omieri in a village brings a lot of attention. Kiosks spring up selling water, food, drinks and other necessities to the visitors wanting to see the snake. Some even urged the government to build a park in order to protect the snake (Daily Nation 2003). Smith (2006) in his analysis argues that the snake is instrumentalised by different people to make their claims. "Glossing something" (Smith 2006: 438f) as Luo tradition can be described as a move to use the snake as a means of acquiring benefits.

10.3 *Eidesstattliche Versicherung*

„Ich versichere hiermit an Eides Statt, dass ich die vorliegende Arbeit ohne unzulässige Hilfe Dritter und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe; die aus fremden Quellen direkt oder indirekt übernommenen Gedanken sind als solche kenntlich gemacht. Darüber hinaus versichere ich, dass ich weder bisher Hilfe von gewerblichen Promotionsberatern bzw. –vermittlern in Anspruch genommen habe, noch künftig in Anspruch nehmen werde. Die Arbeit wurde bisher weder im Inland noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde vorgelegt und ist auch noch nicht veröffentlicht."

Weil am Rhein, Januar 2014